

**ROCKY FLATS PLANT
ENVIRONMENTAL RESTORATION PROGRAM**

**SITE HEALTH AND SAFETY
PLAN WORKBOOK**

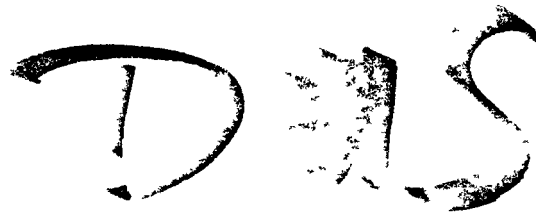
OCTOBER 26, 1990

EG&G- Rocky Flats, Inc.

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REVIEWED FOR CLASSIFICATION/UCM
By George H. Sedore
Date 11/2/90



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1.0 INTRODUCTION

The purpose of this Site Health and Safety Plan Workbook is to assist in the development, preparation, approval and implementation of site specific health and safety plans. A logical progression is outlined which allows the reader to readily assimilate the specific information required for the Site Plan.

The guidance in this workbook should be used in conjunction with Appendix A to prepare the Health and Safety Plan (H&SP) required for work at Environmental Restoration (ER) remedial project work sites. Appendix A is a series of forms that will aid in preparation of the Operable Unit, site-specific or task-specific Health and Safety Plans.

A Site Plan shall be prepared for each remedial project or phase of projects performed by ER. Copies of the Site Plan and the current revision of the Health and Safety Program Plan (HSPP) shall be kept in the site managers trailer at each ER remedial project work site. Copies of applicable reference material such as 29 CFR 1910, 29 CFR 1926, Rocky Flats Emergency Response Manual, EG&G Health and Safety Practices Manual, and applicable ER SOP's shall also be kept on site in the ER manager's office. Any conflicts between reference material requirements shall be brought to the attention of the ER Site Project Manager for immediate resolution.

The Occupational Safety Department is responsible for directing the preparation of the Site Plan and distributing the Site Plan for review and approval. The H&S Coordinator shall initiate changes to the H&SP as work progresses to ensure that it adequately address changing conditions and scope.

When the forms in Appendix A are completed and used along with the HSPP it will provide the minimum documentation necessary for compliance with health and safety regulatory standards, Rocky Flats Plant policies, ER SOPs, and DOE orders for work at hazardous waste sites. Appendix A may also be used to provide baseline information to supplement a more comprehensive format, when deemed necessary. The regulatory standards in 29 CFR 1910.120 outline the minimum required elements for an H&SP.

1.1 General Information (See Appendix A, Section 1)

This section should provide introductory information concerning assigned tasks. This information will provide a broad look at the work which will allow the reader to readily assimilate specific information required in the Site Plan. This section should include:

- o Project Identification - Operable Unit Number, Construction Phase, RCRA Facility Investigation/Remedial Investigation Number or Phase, etc.
- o Project Duration - approximate start and stop dates
- o Project History - a brief review of the pertinent information concerning the background of the work to be performed
- o Scope of Work - an outline of the task to be accomplished
- o Hazard Assessment Overview - identification of the site and task hazards
- o Lead Regulatory Agency (LRA) - determination of the LRA from the Inter-Agency Agreement (IAG)
- o Deliverables and Submittals - This is a written procedure for the delivery of the HSPP and H&SP to subcontractors as required by the Informational Program of OSHA 1910.120. It also provides documentation of the review and approval of the subcontractor's H&SP (See Figure 1-1, page 4).

1.2 Field Change Records D (See Appendix A, Section 2)

The forms contained in this section provide documentation of changes to the H&SP. Changes should be made in ink to the text of the H&SP to alert the reader to changes in the document. The field change form should be attached to the end of the H&SP for reference.

1.3 Assignment of Responsibilities for Key Personnel (See Appendix A, SECTION 3)

This section identifies key project personnel, the organizational structure, and support departments required to safely accomplish ER site tasks. Included in this section shall be a brief description of the health and safety related responsibilities of departments and/or individuals.

FIGURE 1-1
DELIVERABLES AND SUBMITTALS for APPROVALS AND REVIEWS

EG&G-Rocky Flats, Inc.'s execution of the following is based solely upon the specific materials submitted under this requirement and is not to be construed as extending to specific subcontractor standards, practices, or information which have been provided to EG&G by the subcontractor

The Environmental Restoration Division has provided the Environmental Restoration Health and Safety Program Plan to the Subcontractor.

Subcontractor Representative

Date

Environmental Restoration Representative

Date

The Environmental Restoration Division has provided the Environmental Restoration Health and Safety Plan Workbook to the Subcontractor.

Subcontractor Representative

Date

Environmental Restoration Representative

Date

The Environmental Restoration Department has received the Draft Site Specific Health and Safety Plan from the Subcontractor.

Subcontractor Representative

Date

Environmental Restoration Representative

Date

The Subcontractor has incorporated requested changes into the Site Specific Health and Safety Plan

Subcontractor Representative

Date

Environmental Restoration Representative

Date

2.0 SAFETY AND HEALTH ASSESSMENT (See Appendix A, SECTION 4)

The steps contained in this section provide a systematic approach to safety and health assessments for work at ER remedial project work sites. A basic discussion of the concepts associated with hazard assessments is contained in Appendix F.

2.1 Task Identification

Tasks designated in the project scope-of-work must be identified. This identification will allow the Site Health and Safety Coordinator (SHSC) to adequately address the nature of the exposure hazards each employee may encounter. These tasks should be broken down according to methods that are used in Procedure 2.11 - Job Safety Analysis (JSA) or Procedure 2.03 - Operational Safety Analysis (OSA). These procedures are contained in the EG&G Health and Safety Practices Manual. Completed JSAs or OSAs that are applicable to the identified tasks will provide useful information and should be provided as an attachment to the completed H&SP. If no JSAs or OSAs have been completed for the tasks listed, consult with the H&S Liaison Officer to determine if there is a need to create them or if other available information can be utilized.

2.2 Chemical Hazard Identification

Known or suspected contaminants at ER remedial project work sites which present a potential hazard to workers shall be identified. Any additional information available concerning the source, concentration, and sample dates for the chemical shall be included.

Appendix B contains Chemical Data Sheets for selected chemicals listed on ATTACHMENT 4 - HAZARDOUS SUBSTANCE LIST of the IAG. These data sheets provide valuable information concerning the applicable exposure limits of the chemical, symptoms of acute exposure, organs effected by exposure, recommended PPE that should be used when working around the chemical, recommended first aid for exposure, and the physical characteristics of the chemical. This information will be used to estimate the potential for worker exposure to the chemical for each

task previously defined. The applicable Chemical Data Sheets shall be provided as an attachment to the completed Site Plan.

When chemicals are identified at the ER remedial project work sites that are not listed in Appendix B, the information must be obtained to make the estimates required in the assessment. Figure A-1 is provided for the documentation of this information. Submit the completed Figure A-1 sheets (or equivalent) to the Occupational Safety or Industrial Hygiene Divisions for review, and provide copies of these forms as attachments to the H&SP.

Chemicals known to be present at near-by processes in the vicinity of the ER remedial project work site and presenting a potential hazardous exposure to workers, must be identified. Accidental release from these processes may impact the workers at the ER remedial project work sites. Information concerning the source and typical concentration of the chemicals in use can be obtained from the RFP Hazard Communication Program. Copies of the Material Safety Data Sheets (MSDS), and all pertinent Hazard Communication Program information concerning these chemicals, shall be included in the completed Site Plan.

2.3 Biological Hazards Identification

Biological hazards that may be present at the ER remedial project work site must be identified, including the location or source of the hazard, and the probable routes of entry. For example, considerations for biological hazards may be necessary when workers are required to enter remote or seldom visited locations, and when working on or near sewage lines. The low-growing scrub oak stands of the Front Range are a common habitat of the tick. This parasitic insect is a carrier of a number of diseases including the sometimes fatal Rocky Mountain Spotted Fever. Poisonous snakes may also be present in these areas.

Spiders, bees, and wasps can be a considerable hazard for those people with known allergic reactions to the venom. The SHSC should be notified if any worker is sensitive to these insects.

2.4 Radiological Hazard Identification

Known or suspected sources of ionizing radiation for the ER remedial project work site must be assessed. Information concerning the individual nuclide isotopes, specific activity, and Derived Air Concentration (DAC) shall be included.

This information is used by the Dosimetry Division for developing a model of the potential Annual Effective Dose Equivalent (AEDE) and Committed Effective Dose Equivalent (CEDE) for workers at ER remedial project work sites. This model should be generated using the latest advancements in technology and should include measured particle size and solubility data. The Radiological Engineering Division will develop requirements for worker training and an appropriate monitoring program to demonstrate compliance with the radiation protection standards of DOE Order 5480.11, "Radiation Protection for Occupational Workers", (Reference 11) for ER remedial projects

2.5 Physical Hazard Identification

EG&G employees should look for potential safety hazards, and should immediately inform their supervisors of any new hazards so that mitigative action can be taken. Accidents involving physical hazards can directly injure workers and create the potential for additional hazards, for example:

- o increased chemical exposure due to damaged protective equipment
- o danger of enhanced entry of contamination into bloodstream by a cut or abrasion

The operations at ER remedial project work sites have their own variety of potential physical hazards, including, but not limited to: temperature extreme disorders, noise, heavy equipment use, and buried or overhead utilities.

Detailed information concerning the signs and symptoms, control methods, and monitoring techniques for temperature extreme disorders are included in Appendix D of this Workbook.

Excessive noise level sources include drilling rigs, air compressors, electrical generators, and heavy construction equipment. The requirements of EG&G Health and Safety Practices Manual, Procedure 7.06 shall be followed in areas identified as having potential noise levels equal to or exceeding 80 DBA 8-hr TWA.

All motor vehicles that operate as off-highway earth-moving equipment must meet certain requirements for the safety of the operator and surrounding workers. Machines should be maintained in good working order. All vital parts, such as motors, chassis, blades, bladeholders, tracks, drives, hydraulic and pneumatic mechanisms, and transmissions should be inspected daily. Safe practices that shall be implemented while working on or around heavy equipment are detailed below:

- o Care should be taken when working on inclined surfaces to ensure that the machinery does not roll over.
- o Running equipment shall not be left unattended.
- o All bi-directional machines shall be equipped with an operational horn and automatic back-up alarm.
- o Heavy machinery which has roll over protective structures (ROPS) shall have seat belts. Seat belts shall not be present in heavy equipment which does not have ROPS.
- o At least one 5 lb 2A-10 B/C portable fire extinguisher shall be mounted in each vehicle located on a hazardous waste site (i.e , within 100 feet of the exclusion zone).

Underground and overhead utilities must be considered. The minimum clearance distances from overhead power lines and energized electrical systems during operation of a crane or derrick (specified in 29 CFR 1926.550) are determined as follows:

- o 10 feet for voltages ≤ 50 kV
- o 10 feet plus 0.4 feet for each kV above 50 kV

EXAMPLE: For a 75-kV line

- o $10 \text{ ft} + [0.4 \text{ ft} \times (75-50)\text{kV}] = 10 \text{ ft} + [10 \text{ ft}] = 20 \text{ ft}$

Minimum clearance distances from overhead power lines and energized electrical systems (specified in 29 CFR 1926.550) for crane or derricks in transit (no load, boom lowered) are determined as follows:

- o 4 feet for voltages < 50 kV
- o 10 feet for voltages ≥ 50 kV to ≤ 345 kV
- o 16 feet for voltages ≥ 135 kV to ≤ 750 kV

Additional information concerning the safe use of cranes and derricks is contained in EG&G Health and Safety Practices Manual, Section 12.00.

2.6 Task Specific Hazard Assessment

A hazard assessment should be completed for each task identified in the H&SP. The hazard analysis should correlate the physical requirements of the task to each of the hazards identified. This will allow an estimate of the probability for exposure from the various hazards while the task is being performed. The hazard assessment is intended for use by a Certified Industrial Hygienist (CIH) in making decisions concerning the following:

- o the administrative and engineering controls to be established for the task

- o the action levels for initiating engineering controls or PPE for the task
- o the proper Personal Protective Equipment (PPE) ensembles to be used once the action level is reached
- o appropriate site and personnel monitoring to ensure overexposures do not occur

Appendix A, sections 4 and 6 are designed to aid in the decision logic associated with the control of chemical, biological, and radiological exposures.

3.0 TRAINING REQUIREMENTS (See Appendix A, SECTION 5.)

The training requirements for employees working at ER remedial project work sites, must be specified according to the employee's job description and responsibilities. The H&S Liaison Officer is responsible for evaluating the employee's job description and assigning the applicable training requirements for the employee. Table 3-1 outlines the OSHA standard for training hazardous waste site workers as defined in 29 CFR 1910.120. These training requirements are explained fully in Section 5 of the H&SP. Documentation of the employee job description is provided on Figure A-2, Worker/Supervisor Training Checklist. The SHSC will file a copy of Figure A-2 as part of the Employee Training and Medical Certification File at the designated project work site. This file provides a means of tracking completed training.

Prior to obtaining access past the SUPPORT ZONE at an ER remedial project work site, the employee must meet the applicable training requirements contained in Section 5 of the H&SP and provide proper documentation of this training to the SHSC. The SHSC shall sign Figure A-2, Worker/Supervisor Training Checklist, to verify the employee has completed the required training. In addition, the SHSC will document directly supervised field experience by signing Figure A-2, after the "OJT" training requirement is met.

Documentation of Site-Specific Training and Daily/Weekly Tailgate Safety Meetings will be maintained at the ER remedial project work site. Copies of this training documentation shall be provided to the ER Health and Safety Officer for review.

TABLE 3-1
TRAINING REQUIREMENTS OF 29 CFR 1910.120
AND ASSOCIATED EG&G TRAINING CLASSIFICATIONS

<u>Population</u>	<u>Initial * Training</u>	<u>Annual Refresher Training</u>	<u>Certification By Whom</u>
<u>Class I</u>			
<u>General Site Workers</u>			
Laborers Equipment Operators	40 hrs off-site 3 days OJT	8 hours	Instructor or head instructor and trained supervisor
(qualified for level B, C, or D PPE use)			
<u>Class I-S</u>			
<u>Supervisors</u>	40 Hrs off-site 3 days OJT 8 hrs advanced	8 hours	Instructor or head instructor and trained supervisor
(Directly responsible for work performed by Class I workers)			
<u>Class II</u>			
<u>Hazardous Waste Site Workers with Limited Exposure</u>			
	24 hrs off-site 1 day OJT	8 hours	Instructor or head instructor and trained supervisor
Limited Tasks Unlikely to be exposed above PEL No Respirators No Emergencies Exposure < PEL Site fully characterized			
<u>Class II-S</u>			
<u>Supervisors</u>	24 hrs off-site 1 day OJT 8 hours advanced	8 hours	Instructor or head instructor and trained supervisor
(Directly responsible for work performed by Class II workers)			
Emergency Response	May be included in training listed above, prior to responding to emergencies	8 hour	Instructor or head instructor and trained supervisor

* Employers who can show by documentation or certification that an employee's work experience and/or training has resulted in equivalent training do not need to provide initial training to such employee. Documentation of "OJT" is still required.

4.0 PERSONAL PROTECTIVE EQUIPMENT (See Appendix A, SECTION 6)

OSHA (29 CFR 1910.120) requires that when engineering controls or work practices are not feasible, or not required, any reasonable combination of engineering controls, work practices, and PPE shall be used to reduce employee exposure below the Permissible Exposure Limit (PEL), the applicable ACGIH Threshold Limit Value (TLV) and the applicable NIOSH Recommended Exposure Limit (REL).

An evaluation of the hazard assessment information for each task must be completed to decide what administrative controls, engineering controls, and PPE will be used to protect workers. Assignment of specific action levels for the hazards must be made to ensure the timely implementation of Engineering Controls and PPE. Table 4-1 provides commonly used action levels for specific conditions. Appendix D discusses heat and cold stress monitoring in relation to PPE use.

Assignment of protection levels and specific ensemble contents must be made for each task previously identified in the completed H&SP. When establishing the controls required for worker protection, use the guidelines contained in Appendix C concerning selection of PPE. Selection of LEVEL D protection shall be used as minimum protection. Additionally, mandatory selection of a particular level of protection is provided in 29 CFR 1910.120 for the following conditions

- o LEVEL A protection shall be selected if the chemical substance has been identified and requires the highest level of protection for skin, eyes, and the respiratory system based on either: measured or the potential for high concentrations of atmospheric vapors, gasses, or particulates, or; site operations and work activities involve a high potential for splash, immersion, or exposure to IDLH conditions or unexpected vapors and/or gasses that are harmful to skin or capable of being absorbed through intact skin.

- o LEVEL B protection shall be selected when the type and concentration of materials have been identified and require a high level of respiratory protection, but less skin protection. This involves atmospheres with: IDLH concentrations of specific substances that do not represent a severe skin hazard, or do not meet the criteria for use of air-purifying respirators; contain less than 19.5 percent oxygen; or the presence of incompletely identified vapors or gasses is indicated by direct-reading organic vapor detection instruments, but vapors and gasses are not expected of containing high levels of chemicals harmful to skin or capable of being absorbed through the intact skin.
- o LEVEL C protection shall be selected when the types of air contaminants have been identified, concentrations measured, and an air-purifying respirator is available that can remove the contaminant.

accurate worker breathing zone information is available for a task, the atmospheric contaminants will not adversely affect exposed skin to ensure the concentration will be below the action level.

Select PPE on the basis of the manufacturer's published performance characteristics. Consideration must be given for the limitations in protection provided by different PPE for each of the hazardous substances at ER remedial project work sites.

The SHSC shall periodically review the established controls to ensure their effectiveness

Table 4-1
Action Levels for Monitoring Activities

<u>CONDITION</u>	<u>ACTION LEVEL</u>	<u>RESPONSE</u>
Explosive Atmosphere	<10% LEL	Continue Investigation
	10% - 25% LEL	Continue on-site monitoring with extreme care
	>25% LEL	Explosion hazard Withdraw from area immediately
Oxygen Deficiency	<19.5% O ₂	Monitor wearing SCBA or supplied air respirator NOTE: Combustible gas readings may not be valid in atmospheres with <19.5% O ₂
	19.5 - 25% O ₂	Continue investigation with caution O ₂ levels >21% require extreme caution - levels other than normal may be due to the presence of other substances
	>25% O ₂	Fire hazard potential Stop work and consult with SHSC
Radiation Dose Rate	>3 times background	Radiation above background levels signifies possible source(s) of radiation present.
	<0.5 mrem/hr	Continue investigation with caution
	>0.5 mrem/hr	Potential radiation hazard Control area, contact Operational Health Physics for evaluation of potential worker exposure estimate Initiate worker radiation training and dosimetry if necessary
Airborne Radionuclides	>10% of DAC	Post area as AIRBORNE RADIOACTIVITY AREA, provide respiratory protection as specified by Operational Health Physics
Noise	>80 dBA	Monitor surround area. Institute engineering controls and/or provide hearing protection
Organic or Inorganic gasses and vapors	*50% PEL	Consult Chemical Data Sheets or standard manuals for air concentration/toxicity data *Action levels depend on actual PEL/TLV/REL

* LEL - Lower explosive limit

Table 4-1(cont)
Action Levels for Monitoring Activities

<u>CONDITION</u>	<u>ACTION LEVEL</u>	<u>RESPONSE</u>
Heat Stress while wearing		
Permeable clothing	>77.5 °F WBGT	Monitor temperature with a WBGT and initiate work/rest regime to reduce exposure below TLV for work load
Impermeable clothing	>77.2 °F Adjusted Temperature	Monitor worker heart rate and oral temperature, adjust work/rest regime to maintain heart rate below 110 beats/minute and oral temperature to less than 99.6°F

• WBGT - Wet Bulb Globe Thermometer

5.0 MEDICAL SURVEILLANCE REQUIREMENTS (See Appendix A, SECTION 7)

The medical surveillance requirements contained in Section 5 of the H&SP shall be met for all workers at ER remedial project work sites. These requirements include the following:

- o Employees shall have baseline physical examinations prior to working at any ER remedial project work site, and termination physicals after completing work or employment with EG&G. The exam shall include a baseline bioassay for the assessment of pre-project radiological exposure.
- o Employees must have periodic medical examinations every 12 months, or at a frequency determined to be appropriate (no greater than bi-annually) by the Medical Department.

Specific information concerning employee exposure must be supplied to the physician prior to the physical examination. The SHSC will provide documentation of historic exposure information related to site activities on Figure A-3, Medical Surveillance Information Sheet and Figure A-4, Hazardous Material Access Log.

6.0 SITE MONITORING (See Appendix A, SECTION 8)

Monitoring shall be performed when there is a potential for employee exposure to hazardous concentrations of contaminants at ER remedial project work sites. Monitoring will assure that the employee's exposure is below the "Permissible or Published" exposure limits and maintained "As Low As Reasonably Achievable" (ALARA).

Monitoring at the ER remedial project work site will provide valuable information about the initial assumptions of hazardous exposure levels, identification of the contaminants present, and the effectiveness of engineering controls.

An environmental monitoring program for radionuclides will be required for all work sites. ER projects will require soil sampling and air monitoring programs.

Personnel monitoring information is used for the ongoing evaluation of protection levels, content of PPE ensembles, and monitoring points in the medical surveillance program. Daily monitoring records will be kept by the SHSC and routinely archived. Industrial Hygiene shall keep monitoring records for EG&G personnel. Subcontractors will maintain monitoring data for their personnel.

The methods and equipment selected for use at ER remedial project work sites must conform to the latest advancements in the health and safety industry recognized and approved by OSHA, NIOSH, and the DOE. The methods and equipment may include direct-reading air monitoring, radiation and contamination surveys, worker breathing zone sampling, area sampling, and physical hazards monitoring. The operation, calibration, and maintenance procedures for each instrument or piece of equipment must be kept at ER remedial project work sites as well as documentation of all repairs, adjustments, and calibration results.

7.0 SITE CONTROL PROGRAM (See Appendix A, SECTION 9)

Site control measures are necessary to control employee and general public (includes untrained employees) exposure to the hazardous materials present at ER remedial project work sites.

7.1 Map of the ER Remedial Project Work Site

Provide a map of the ER remedial project work site showing the current location of control boundaries. This map should give the locations of evacuation routes, first aid stations, communication facilities, areas of safe refuge, sanitary facilities, and other support facilities

7.2 "Buddy System"

All activities past the SUPPORT ZONE (i.e., within the contamination reduction or exclusion zone) shall be conducted using the "buddy system". When ALARA calls for only one person to

perform a task, the "buddy" may not necessarily be required to enter the area. In all conditions, the "buddy" shall be able to:

- o provide his/her partner with prompt assistance,
- o observe his/her partner for signs of chemical or heat exposure,
- o periodically check the integrity of his/her partners protective clothing, and
- o notify the SHSC or another if emergency help is needed.

7.3 Site Communications

Effective communications at the ER remedial project work site will dramatically increase the efficiency of the operations. Two sets of communication systems should be established providing internal communications to workers at ER remedial project work sites and external communications to employees off of the ER remedial project work sites.

When selecting the internal communication system, the following points should be considered

- o Verbal communication at the ER remedial project work sites will likely be impeded by high background noise, especially when workers are required to wear respiratory protection. Development of both audio and visual communication signals will mitigate some of these problems.
- o Workers will appear similar when wearing protective clothing. Color coded markings and name tags (front and back) can help to prevent confusion.
- o Some communication devices may not be suitable for use in potentially explosive atmospheres.

Before an external communications system may be used on the RFP plantsite, the equipment must be checked and approved by the Communications Systems department and the Technical Security department.

7.4 Site Work Zones

The following definitions shall be used for ER remedial project site chemical work zones.

- o EXCLUSION ZONE - The contaminated area.
- o HOT LINE - The outer boundary of the EXCLUSION ZONE.
- o CONTAMINATION REDUCTION ZONE - A buffer area to prevent casual access to the EXCLUSION ZONE.
- o CONTAMINATION CONTROL LINE - The outer boundary of the CONTAMINATION REDUCTION ZONE.
- o SUPPORT ZONE - The uncontaminated area surrounding the CONTAMINATION REDUCTION ZONE where workers are not exposed to hazardous conditions.
- o DECONTAMINATION CORRIDOR - Area providing access and egress from the EXCLUSION ZONE to the SUPPORT ZONE; also, the area where decontamination takes place.
- o CONTROL POINT - Stations at the ends of the DECONTAMINATION CORRIDOR providing access to and egress from the EXCLUSION ZONE to the SUPPORT ZONE
- o CONTROLLED AREA - All points within the CONTAMINATION CONTROL LINE

The posting of zones, with respect to radiological contaminants, is based on the directives contained in 5480.11 DOE.

7.5 Placement of Boundaries

Boundaries, for the different control zones, shall be constructed of construction security fencing, snow fencing, or barrier ribbon, depending on the degree of security required for the zones and the ease of access to the area.

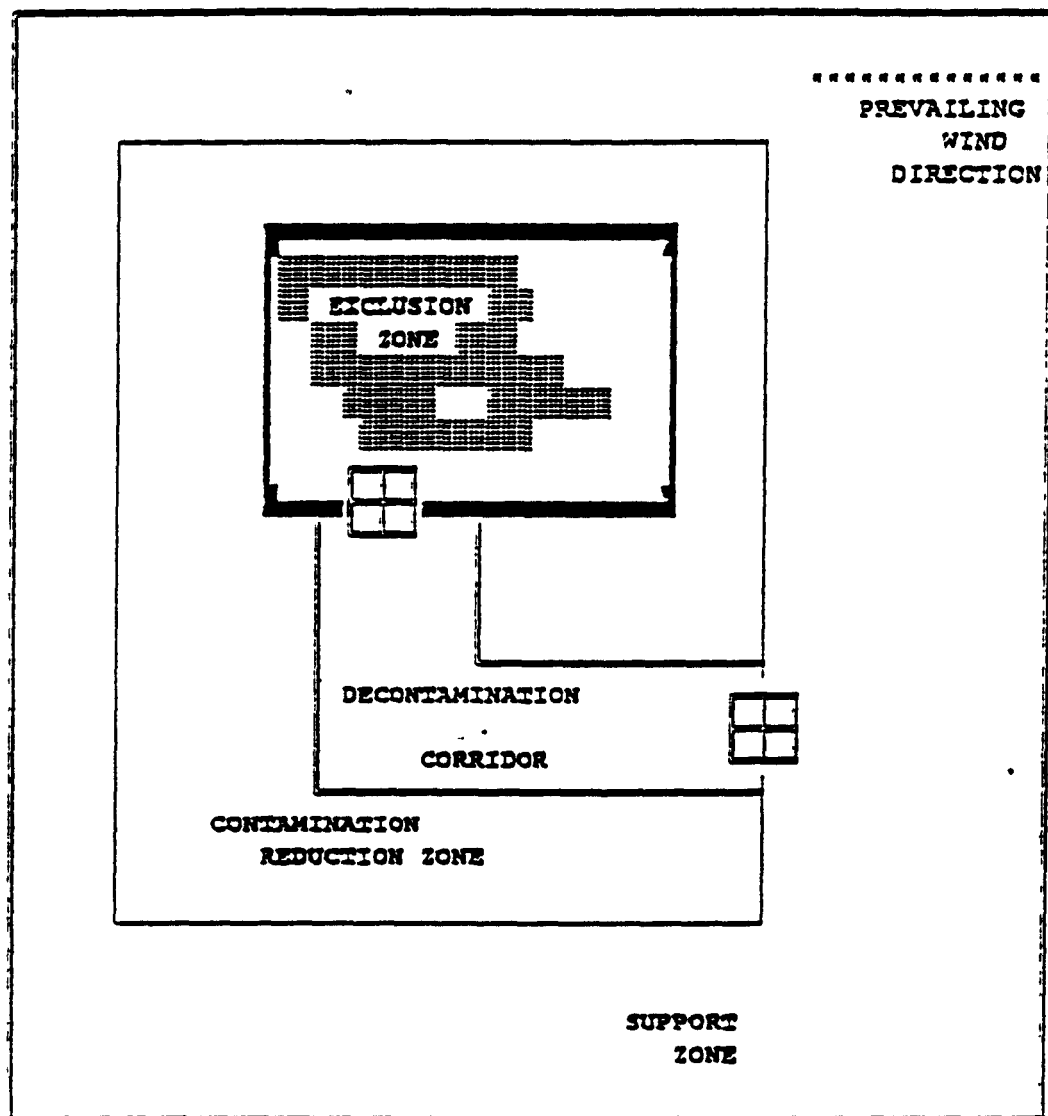
When the SHSC is deciding where the HOT LINE shall be placed, a visual survey of the remedial ER project work site should be conducted to determine.

- o the location of the contaminated material derived from a review of the site-specific data;
- o the distances necessary to prevent contamination spread during performance of tasks;
- o the location and distances required for safe refuge or area evacuation;
- o the area required for site operations;
- o prevailing wind direction; and
- o probable meteorological conditions.

Once the HOT LINE has been established, modification of its location may be required as conditions change. Any required changes to the HOT LINE shall be approved by the SHSC. Access control points shall be established at both ends of the DECONTAMINATION CORRIDOR to control the flow of personnel and equipment into and out of the work area. Hazardous Material Access Logs shall be maintained in the Support Zone for all employees that enter the Exclusion Zone. An example of the boundary design is given in Figure 7-1. The exact configuration of the site control boundaries may change for each task performed. The SHSC is responsible for:




- o ensuring that the boundaries are all posted clearly,
- o communicating the entry requirements for the control zones to all personnel at the ER remedial project work site, and
- o maintaining the Hazardous Materials Access Log.

Figure 7-1



Area dimensions given are not to scale, distances between points can vary.

LEGEND:

-  - ACCESS CONTROL POINTS
-  - HOT LINE BOUNDARY
-  - CONTAMINATED AREA

7.6 Posting

All zones must conspicuously delineated. The extent of posting (e.g., tape, permanent signs, etc.) for each site will be based on the severity of the hazards associated with the site. Posting requirements will be determined by the Health and Safety Department and Environmental Restoration. Posting requirements may include chemical warnings, radiological warnings, and PPE requirements.

7.7 Site Security

Physical barriers shall be erected to prevent the exposure of unauthorized and/or unprotected personnel to the hazards on the site. During working hours, site security shall be provided by the ER Health and Safety Coordinator. During off-hours the ER remedial project work sites shall be secured or a guard shall be stationed to maintain security. The normal routine of the RFP Security Guards may provide adequate security for the ER remedial project work sites.

7.8 Visitor Controls

All visitors to the ER remedial project site shall participate in a visitor briefing conducted by the SHSC. Visitors shall be cautioned to avoid skin contact with contaminated or potentially contaminated surfaces and to stay outside of the Contamination Reduction Zone. Visitor access past the Support Zone must be cleared by the ER Program Manager or a designated alternate. Visitors requesting to enter the controlled areas beyond the contamination control line, to observe work, shall be required to.

- o provide documentation of training required on Figure D-2, Worker/Supervisor Training Checklist;
- o complete medical surveillance requirements listed in Section 5 of the H&SP and provide the information requested on Figure D-3, Medical Surveillance Information Sheet; and
- o comply with all the requirements of this HSP and the H&SP associated with the ER remedial project work site visited.

8.0 DECONTAMINATION (See Appendix A, SECTION 10)

The objective of decontamination is to remove hazardous substances from workers and equipment, to assure compliance with DOE order 5480.11 and OSHA Standard 1910.120, and to preclude the occurrence of potential adverse health effects that could be caused by contact with hazardous materials. Decontamination requirements and procedures at ER sites will vary according to the task being performed and the hazardous materials encountered. The following ER SOPs are mandatory directives for Environmental Restoration site decontamination:

- o Personnel Decontamination 1.2
- o General Equipment Decontamination 1.9
- o Heavy Equipment Decontamination 1.14
- o Handling of Decontamination Water and Waste Water 1.17

8.1 Personnel Decontamination

Personnel decontamination procedures used at ER remedial project work site shall be posted in a location where personnel exiting the Exclusion Zone will be able to read through the step-by-step requirements without handling the procedure. Compliance with the posted step-off decontamination sequence will provide the final measures necessary to prevent worker exposure to the hazards present on the site. The step-off sequences contained in the H&SP will allow the greatest amount of flexibility possible. However, deviation from the flow pattern is not allowed. Failure to complete all steps, in sequence, may result in the release of a hazardous contaminant into the Support Zone.

8.2 Radiological Decontamination

Personnel shall be monitored by a qualified Radiological Operations Technologists for radioactive contamination on their clothing and skin upon exiting any radiation controlled area.

at an ER remedial project work site, prior to showering. Skin contamination events require response by Radiological Engineering. Emergency showers and eyewashes shall be located on any site where the potential for skin or eye exposure exist.

8.3 Equipment Decontamination

Before removing any equipment from the CONTROLLED AREA at the remedial project work site, radioactive contamination shall be reduced to ALARA and, at most, the levels specified in DOE Order 5480.11 incorporating the guidelines set forth in section 18.02 of the Health and Safety Practices Manual.

Before removing any equipment from the CONTROLLED AREA that may be contaminated with non-radioactive contaminants, that equipment shall be decontaminated or containerized. The SHSC is responsible for ensuring that equipment leaving the site has been adequately decontaminated

Equipment decontamination shall be conducted within the DECONTAMINATION CORRIDOR. Small equipment (such as hand implements and sample collection equipment) may be decontaminated at the Personal Protective Equipment decontamination stations. Large equipment (such as a loader, backhoe, or truck) will require more room and facilities for a high-pressure washer, collection of water run-off, and over-spray control.

8.4 Personal Protective Equipment Decontamination

Personal protective garments worn within the Exclusion Zone and Decontamination Corridor shall not be worn outside the Contamination Control Line. All site personnel shall follow the step-off decontamination sequence whenever they leave the ER remedial project work site.

The SHSC shall modify the decontamination procedures when a change in conditions at the ER remedial project work site warrants a change in the level of protection prescribed.

Used protective clothing being disposed of at the decontamination station, shall be placed into suitable receptacles.

- o Polyethylene bags may be used for this purpose provided they are sealed daily
- o Contaminated protective clothing shall not be removed from the decontamination area until it has been properly bagged and identified.

Adequate facilities for washing hands and face will be available at the decontamination station to meet the minimum sanitation requirements. Hands and face shall be washed prior to eating or drinking and before leaving the site at the end of each shift.

When the duration of work at the ER remedial project work site is longer than 6 months, showers and change rooms shall be provided. Personnel shall shower at the facilities provided at the ER remedial project work site. When facilities are not provided, personnel should shower at the first opportunity after completion of daily activity at the ER remedial project work site.

The stations listed for decontamination shall be set-up in the DECONTAMINATION CORRIDOR. Access to the decontamination area from the SUPPORT ZONE shall be controlled at an Access Control Point. The SHSC is responsible for ensuring that the steps of decontamination are carried out properly and that a Hazardous Materials Access Log is maintained at the Access Control Point to provide accurate documentation of the potential exposure time of workers and supervisors.

Mild soap solutions will usually be used for decontamination purposes. Soap solutions can be disposed of in 55-gallon drums that are properly labeled as required by the Waste Disposal SOPs. Storage or disposal of drums shall be determined by waste operations. In the event that additional decontamination solutions are required for site operations, waste operations will advise on the appropriate storage containers and disposal methods.

9.0 EMERGENCY RESPONSE PLAN (See Appendix A, SECTION 11)

The emergency response plans, contained in this section, are intended to provide the necessary link between the activities at the Environmental Restoration Department project worksites, the Rocky Flats Emergency Plan, and the Compliance and Permitting Division's RCRA Emergency Response Plan.

9.1 Purpose

Emergency procedures minimize the impact of any emergency, or unusual occurrence, upon the health and safety of personnel at the ER remedial project work site. These procedures also identify the manpower and equipment resources available to cope with industrial, radiological, and natural emergencies.

Specific actions for response to accidents and injuries, at the ER remedial project work site, are contained in this section. Information concerning reporting or responding to emergencies off of the ER remedial project work site are contained in the Rocky Flats Emergency Plan.

Periodic rehearsals of the procedures contained in this section shall be documented as part of the overall training program for site operations. The responders and key people affected by the use of this procedure shall provide written comments and a critique of the exercise's effectiveness. This information shall be used by the ER Project Manager to evaluate and modify this section.

9.2 Key Personnel

The names and phone extensions for the key personnel at ER remedial project work sites, with the authority and training to respond to accidents and unusual conditions, must be posted and accessible to the workers. These personnel include the:

- o Environmental Restoration Project Manager,
- o Site Health and Safety Coordinator,
- o Subcontractor Site Health and Safety Coordinator, and
- o Subcontractor Field Engineer/Foreman.

The local responders at the Rocky Flats Plant, that are trained to respond to emergencies addressed in this section, shall be posted. They include:

- o EMT / AMBULANCE ext. 2911
- o FIRE ext. 2911
- o POLICE/ SECURITY ext. 2911

The succession of authority, on the ER remedial project work site, for the "Person-in-Charge" until relieved by the on-scene the Emergency Director, is as follows:

1. Environmental Restoration Project Manager
2. Site Health and Safety Coordinator
3. Subcontractor Field Engineer
4. Subcontractor Health and Safety Coordinator

The key personnel shall respond to emergencies according to the specific procedures found in the H&SP and the Rocky Flats Emergency Plan (Reference 18).

9.3 Medical Emergency Response Procedures

If an employee working in a contaminated area is physically injured, Red Cross First-Aid procedures shall be followed. The SHSC is required to be a current card holder for the Red Cross First-Aid and Adult CPR courses. The texts provided for the Red Cross courses shall be kept in the Project Managers trailer, at the ER remedial project work site, for use as Standard Operating Procedures for medical emergencies. The following list provides examples of the types of medical emergencies that should be planned for:

- o Fractures, dislocations, sprains and strains
- o Severe bleeding, cuts, scrapes and bites
- o Temperature extremes disorders
- o Heart attacks and strokes
- o Seizures
- o Diabetic emergencies
- o Poisoning
- o Burns, including fire and chemical
- o Shock

The steps to be taken by workers at the site, when a medical emergency occurs, shall be identified to provide instructions for the worker from the time of the injury, until the "Person-in-Charge" and SHSC arrive on scene. Be sure to discuss the communications required and the decisions for transporting injured workers.

9.4 Fire Response Procedures

The actions to be taken when a fire occurs at an ER remedial project work site shall be identified to provide the workers with guidance. In all cases, the Fire Department shall be notified at ext 2911

- o Small, localized fires shall be handled using the appropriate fire extinguishers, by trained personnel only, to bring the occurrence under control
- o Uncontrolled fires shall be handled by the Fire Department, workers should use the manual fire telephone station or call ext. 2911, then evacuate the area.
- o If the fire releases potentially toxic gases, all persons in the immediate vicinity shall be evacuated (sound the evacuation alarm). The fire department should then be informed of the toxic gases

9.5 Notification and Reporting

The employee who discovered the emergency is responsible for immediately reporting the situation, by the most expeditious means available, to the person in charge at the ER remedial project work site. To prepare the H&SP, list the procedure for reporting an emergency off of the ER remedial project work site in Appendix A.

9.6 Equipment

In an emergency, equipment will be necessary to communicate with local responders, rescue and treat victims, protect response personnel, and to mitigate hazardous conditions on site.

To prepare the H&SP, list the equipment that will be at the ER remedial project work site to be used for emergency response, in Appendix A. This list should include, but not be limited to, the following:

Communication equipment

- o Telephones (Cellular Phones)
- o Portable radios
- o Megaphone/Bullhorn
- o Alarm devices (Air horn, siren, whistles)

Heavy Equipment

- o Heavy equipment used for day-to-day operations, may be required during an emergency. This equipment should be maintained in running condition and with a fuel level greater than one-fourth full.
- o Equipment repairs should be conducted when the defect is detected so that the equipment is always available for use. Heavy equipment operators shall ensure that heavy equipment does not leak oil.

Personal Protective Equipment

- o personal protective equipment must be kept in reserve and maintained for emergency use. This equipment may be from the same stock that is used for daily operations, provided the portion of stock reserved for emergency use is not depleted.

- o The next level of protection up from that used for routine operations, must be available. For example, if Level C is the maximum routine level of protection used, then Level B protective equipment must be on hand for emergency use. This would include maintaining SCBA units on site although the usual operations utilize only air-purifying filter respirators.

Other Equipment

- o First aid kits via EMTs
- o Fire extinguisher and blanket
- o 15-Minute eye wash and quick drench shower
- o 10 gallons of water, in portable containers
- o Decontamination solutions appropriate for the on-site hazards.

9.7 Alarms

Alarm signals shall be used on the ER remedial project work site. They shall be included as standard alarm signals, to avoid confusion from one ER remedial project work site to another. They may be heard on a demonstration tape by dialing 966-7541.

10.0 CONFINED SPACE ENTRY (See Appendix A, SECTION 12)

The procedures for working in a confined space are documented in EG&G Health and Safety Practices Manual, Procedure 6.04. The SHSC is responsible for identifying tasks that require work in confined spaces and ensuring that the work is performed in compliance with EG&G procedures.

The tasks identified in Section 3.1, that will include confined space work, must be identified. The SHSC will ensure that, prior to starting work, a daily "Confined Space Work Permit" is obtained.

11.0 SPILL CONTAINMENT PROGRAM (See Appendix A, SECTION 13)

Adequate spill containment equipment is required during operations that may cause a major spill to provide for isolation and containment of the entire volume of the hazardous substance spilled. Spills that occur outside the boundaries of ER remedial project work sites will be covered by the RCRA Permitting and Compliance (RCRA) Standard Operating Procedure (SOP) HW-11. Spills that occur within the boundaries of the ER remedial project work site shall be responded to by the workers on site. Those spills which exceed the reportable quantity threshold as defined under RCRA shall be immediately reported to ER as soon as possible. Materials required to respond to a spill shall be maintained at the ER remedial project work site.

The tasks that present a spill hazard must be identified, including a list of the materials that will be maintained on the ER remedial project work site for use in spill response and the detailed step-by-step actions to be taken to respond to the spill. List persons responsible for completion of the actions.

APPENDIX A

**Health and Safety Plan
Form**

Health and Safety Plan

Review and Approval Signatures.

_____/_____
ER Health and Safety Officer Date

_____/_____
ER Program Manager Date

_____/_____
Director - Environmental Restoration Date

_____/_____
Health and Safety Liaison Officer Date

_____/_____
Occupational Safety Manager Date

_____/_____
Director - Health and Safety Date

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HEALTH AND SAFETY PLAN (HSP) FORM

1.0 GENERAL INFORMATION

1.1 Project Identification

- Operable Unit Number _____
- Construction Phase or RI/FS Number . _____
- SWMU Numbers included in scope of work

1.2 Project Duration

Approximate: Start date _____ End date _____

1.3 Site History

- Describe briefly the information from the IAG that is pertinent to the scope of work to be performed:

1.4 Scope of Work

- Describe briefly the scope of work to be performed:

1.5 Hazard Assessment Overview

- Indicate types of hazards anticipated:

- () Physio-chemical; Toxic Chemical - Levels
 - () >PEL-TWA
 - () >PEL-STEL
 - () >IDLH
 - () SKIN DESIGNATION
 - () <OSHA-PEL
- () Bio-hazards
- () Radioactive Materials
- () Physical hazards
- () Construction hazards

1.6 Lead Regulatory Agency

- The Lead Regulatory Agency (LRA) defined in the IAG:

- () U.S. Environmental Protection Agency
- () Colorado Department of Health
- () Joint U.S.EPA/ CDH

1.7 EG&G Subcontractors Deliverables and Submittals

- List each subcontractor working on the site. Date and initial the completion of required actions:

Subcontractor Name	ER HSPP Provided	ER Site HSP Provided	Recvd Subs HSP	Reviewed Subs SHSC Qualifications

2.1 Record of Field Changes

[illegible]

HSP FIELD CHANGE

Field Change Number: _____

Date Effective: _____

Review and Approval Signatures:

ER Health and Safety Officer

/ _____
Date

ER Program Manager

/ _____
Date

Director - Environmental Restoration

/ _____
Date

Health and Safety Liaison Officer

/ _____
Date

Occupational Safety Manager

/ _____
Date

Director - Health and Safety

/ _____
Date

3.0 KEY PERSONNEL ASSIGNMENTS

3.1 EG&G Personnel

- _____	<u>ER Program Manager</u>	_____
Name	Title	phone ext
- _____	<u>ER H&S Officer</u>	_____
Name	Title	phone ext
- _____	<u>Director - ER</u>	_____
Name	Title	phone ext
- _____	<u>Occ. Health Dir.</u>	_____
Name	Title	phone ext
- _____	<u>Site H&S Coordinator</u>	_____
Name	Title	phone ext
- _____	<u>H&S Liaison Officer</u>	_____
Name	Title	phone ext
- _____	<u>Mgr - Occ. Safety</u>	_____
Name	Title	phone ext
- _____	<u>Director - H&S</u>	_____
Name	Title	phone ext

3.2 Additional Personnel

- _____	_____	_____
Name/Title	Organization/Branch	phone ext

Role and Responsibilities: _____

- See "Introduction to Basic Concepts" in APPENDIX G of the Health and Safety Program workbook for an overview of the application of the information presented in this section.

4.1 Task Identification

- Identify and number each specific task to be accomplished. The task numbers will be used when identifying specific hazards and required engineering controls and PPE for that task. Use the methods detailed in the Job Safety Analysis/Operational Safety Analysis procedures for task breakdown.

[illegible]

4.2 Chemical Hazards

a) Chemical Hazard Directly Related to Tasks

- Identify and attach Chemical Data Sheets contained in APPENDIX B of the HSWB for all chemicals that are known or suspected contaminants at this remedial project work site. Complete a new Chemical Data Sheet, FIGURE A-1, for any contaminants not listed in APPENDIX B of the HSWB. The new Chemical Data sheets must be provided to the Health and Safety Liaison Officer for review and approval by Industrial Hygiene.

- List the potential sources of these contaminants and the concentrations found during site characterization or RI/FS sampling

CHEMICAL NAME	SOURCE*	CONCENTRATION (UNITS)	DATES OF SAMPLING

* Source codes: A-Air, S-Soil, G.W.-Groundwater, S.W.-Surface Water, O-Other

COMMON CHEMICAL NAME: _____

CAS#: _____ RTECS: _____ RCRA WASTE NUMBER: _____

Synonyms: _____

	<u>TWA</u>	<u>STEL</u>	<u>CEIL</u>	<u>IDLH</u>	<u>ACTION LEVEL</u>
	ppm mg/m ³	ppm mg/m ³	ppm mg/m ³	ppm mg/m ³	ppm mg/m ³
OSHA PEL:					
NIOSH REL:					
ACGIH TLV:					

RESPIRATORY PROTECTION RECOMMENDATIONS
ABOVE THE DESIGNATED ACTION LEVEL

CARCINOGEN [] TERATOGEN [] MUTAGEN []

Target Organs: .

Physical Characteristics:

SYMPTOMS:

MF:

MW:

SG:

VP:

IP:

ODOR THRESHOLD:

PERSONAL PROTECTIVE
EQUIPMENT REQUIREMENTS:

CLOTHING:

GOGGLES:

WASH:

CHANGE:

REMOVE:

RECOMMENDED FIRST AID RESPONSE:

EYES:

SKIN:

INHALATION:

INGESTION:

FIGURE A-1: CHEMICAL DATA SHEET

b) Chemical Hazards Indirectly Related to Work - Nearby processes that could affect ER remedial project work site workers:

- Identify and attach the Material Safety Data Sheets, from the Hazard Communications Program of the nearby facility, for all chemicals that are potential contaminants to this ER remedial project work site.

- List the potential sources of these contaminants and the concentrations of the chemicals used.

CHEMICAL	*SOURCE	CONCENTRATION (UNITS)

*Source codes: A-Air, S-Soil, G.W.-Groundwater, S.W.-Surface Water, O-Other

4.3 Biological Hazards

- List the potential sources of these contaminants and the concentrations of the chemicals used. Check with the workers at the site to ensure that any allergic or sensitized personnel are identified.

Hazard	Location or Source	*Route of Entry
Poisonous Plants		
Insects		
Snakes		
Animals		
Sewage		
Parasites		
Others-		

*Routes of entry: Inh-Inhalation, Ing-Ingestion, Abs-Absorption, Inj-Injection

4 4 Radiological Hazards

- List the ionizing hazards suspected or known to exist at the ER remedial action work site. Specify (when possible) the isotope, relative activity, and type of activity (alpha, beta, gamma).

If the specific isotope is not known, specify activity levels and activity types

- Obtain the EG&G Dosimetry estimate of the potential worker annual effective dose equivalent (AEDE) and committed dose equivalent (CEDE) from all intakes and sources. Ensure that the training and monitoring requirements (developed by Radiological Engineering) meets the standards prescribed by DOE 5480.11, "Radiation Protection for Occupational Workers".

4.5 Physical Hazard Identification

- Identify from the listing below the physical hazards that are present and the specific task to which they are related. Identify which hazards are addressed in completed JSAs or OSAs and provide copies of the completed documents as attachments.

	Hazard (Y/N)	TASK No(s).	JSA/OSA Attached
Noise	()	_____	_____
Heat - ambient air	()	_____	_____
- Hot Process - Steam	()	_____	_____
- Hot Process - Incin.	()	_____	_____
Cold	()	_____	_____
Rain	()	_____	_____
Snow	()	_____	_____
Electric Storms	()	_____	_____
Confined Space Entry	()	_____	_____
"Hot Work" - Welding	()	_____	_____
- cutting	()	_____	_____
- burning	()	_____	_____
Heavy Manual Lifting/Moving	()	_____	_____
Rough Terrain	()	_____	_____
Structural Integrity	()	_____	_____
Remote Area	()	_____	_____
Compressed Gases	()	_____	_____
Diving	()	_____	_____
Using Boats	()	_____	_____
Working over Water	()	_____	_____
Traffic	()	_____	_____
Explosives	()	_____	_____
Heavy Equipment Operation	()	_____	_____
Lift Equip. Operation - Cranes,	()	_____	_____
- Manlifts	()	_____	_____
Working at Elevation - Ladders	()	_____	_____
- Scaffolding	()	_____	_____
Excavating/Trenching	()	_____	_____
Materials Handling	()	_____	_____
Haz Mat Use/Storage-flam liq/gas	()	_____	_____
-oxidizers	()	_____	_____
-corrosives	()	_____	_____
Demolition	()	_____	_____
Utilities - Underground	()	_____	_____
- Overhead	()	_____	_____
Electrical - General	()	_____	_____
- High Voltage	()	_____	_____
Hand Tools	()	_____	_____
Power Hand Tools	()	_____	_____
High Pressure Water	()	_____	_____
Other	()	_____	_____
Other	()	_____	_____
Other	()	_____	_____

4.6 Task by Task Hazard Analysis

- The preceding sections identify the hazards known or suspected to be present when accomplishing the tasks involved in this project.

- Using the task numbers established in Section 4.1, briefly describe each task and the likelihood of exposure to the hazards identified.

- Attach additional sheets as necessary.

1.

2.

5.0 TRAINING ASSIGNMENTS

5.1 Confidential Employee Training and Medical Certification File

- Initiate a file for maintaining training records and medical surveillance records for each employee. Copies of the following records, associated with training, will be maintained in this file:

- 1) Worker/Supervisor Training Checklist
- 2) Initial/Refresher Initial Training Certificate
- 3) Radiation Worker Training Record of Training Attendance (POT)
- 4) Site-specific Training ROTA

5.2 Specification of Individual Training Requirements

- Complete a job description in Figure A-2, Worker/Supervisor Training Checklist, for each employee that will work at the ER remedial project work site.

- Obtain the Health and Safety Liaison Officer's determination of the training requirements for the employee.

- Inform the employee of the training requirements to be met. Schedule or have employee schedule attendance of the training classes needed with the EG&G Training Department.

- Access to the controlled areas of the ER remedial project work site shall not be granted to any employee who has not completed and documented the training requirements in this checklist.

5.3 Safety Training Records Maintenance

- The Site Health and Safety Coordinator shall maintain the Confidential Employee Training and Medical Certification Files at the ER remedial project work site. The ER SHSC will also maintain the Safety Summary Report for the Weekly Tailgate Safety meetings.

WORKER/SUPERVISOR TRAINING CHECKLIST

EMPLOYEE NAME _____

TITLE _____

SSN _____

Briefly describe the worker/supervisor job description and responsibilities:

Based on the above job description this employee will require:

- _____ hours of off-site initial instruction
40 / 24
- _____ day(s) of on-site "OJT"
3 / 1
- _____ require 8 hours of supervisory training
will/will not

H&S Liaison Officer

Date

Annotate date of documented completion and attach copies of documentation:

Initial Off-Site Training

SHSC

Date

Supervisory Off-Site Training

SHSC

Date

Supervised Field Experience (OJT)

SHSC

Date

Radiation Worker Training

SHSC

Date

Site-Specific Training

SHSC

Date

Hazard Communication Training

SHSC

Date

FIGURE A-2 Worker/Supervisor Training Checklist

6.0 PERSONAL PROTECTIVE EQUIPMENT

6.1 Selection of Ensembles and Equipment

- For each task identified in Section 3.1 of this Site Health and Safety Plan Form, complete Parts A, B, C, and D of this Section. The determination of Administrative Controls, Action Levels, Engineering Controls, and proper Personal Protective Equipment shall take into account the task hazard analysis performed in Section 3.6.

TASK # _____

a) Engineering Controls

- Describe Engineering Controls and Work Practices to be used as part of the Personal Protection Plan that will reduce the probability of exposure identified in the task hazard Analysis:

b) Action Levels for Changing Levels of Protection

- Define Action Levels for up or down grade of PPE. Generally action levels are set at 50% of the lowest value for the PEL/REL/TLV.

c) Description of PPE Level required: A / B / C / MOD-D / D (circle one)

- Detail the conditions that warrant the selection of this level of PPE. The discussion for recommended protection levels and the conditions that they should be used is contained in Appendix C.

d) Ensemble Components

Route of Exposure	Protection Required ?	Protection Provided By Following:
Respiratory System		
Head		
Eyes		
Ears		
Face		
Hands		
Arms		
Trunk		
Legs		
Feet		
Other:		
Other:		
Other:		
Other:		
Other:		
Other:		
Other:		

NOTES:

- Be specific when describing the method for protection. List the brand of equipment to be used. Be sure to check the manufacturer's test data for the product against the hazardous materials that are present.
- Include ANSI certification compliance data where applicable
- Fill in all the spaces; if one is not applicable, write N/A

7.0 MEDICAL SURVEILLANCE

7.1 Required Information

- The Medical Department requires some specific information to be supplied to meet the regulatory standards of 29 CFR 1910.120 and DOE Order 5480.8.

- Complete Figure A-3, Medical Surveillance Information Sheet, to provide the required information for baseline physical examinations.

- Daily maintenance of Figure A-4, Hazardous Materials Access Log, will provide to required information for periodic and termination physicals.

7.2 Record-keeping

- The Health and Safety Liaison Officer or SHSC shall retain a copy of the completed Figure A-3 for each employee in the Confidential Employee Training and Medical Certification File at the ER remedial project work site

- The Occupational Safety Division will maintain the completed Figure A-4 along with the exposure data gathered during area sampling and personnel monitoring.

- These records must be accessible to the employee for review.

MEDICAL SURVEILLANCE INFORMATION SHEET

EMPLOYEE NAME _____

TITLE _____

SSN _____

Operable Unit _____

Phase _____

Describe the employee's duties as they relate to the exposures at the ER remedial project site:

Detail the estimated exposure levels anticipated for this employee at this ER remedial project site:

Describe the Personal Protective Equipment (PPE) that this employee is anticipated using at this ER remedial project site:

FIGURE A-3 Medical Surveillance Information Sheet

HAZARDOUS MATERIAL ACCESS LOG

Date

Operable Unit Number

Phase Number

List the hazardous materials present in the work area and the concentrations (if available):

Names of employees entering area	Time of each entry	Time of each exit	Enter the coded numbers from below	
			Work Activities Performed	Personal Protective Equipment Used

WORK ACTIVITIES

- 1 Soil sampling, placing dirt in containers
- 2 Augering, drilling, radiologic measurements
- 3 Walking across, standing on or near contaminated areas
- 4 Examining excavations
- 5 Water sampling
- 6 Monitoring removal of contaminated material
- 7 Other
- 8 Other
- 9 Other

PROTECTIVE EQUIPMENT

- A-1 Safety Boots, A-2 Outer Boot Coverings
 B-1 Permeable Coveralls B-2 Non-Permeable Coveralls
 C-1 Disposable Gloves C-2 Reusable Gloves
 D-1 Safety Glasses/Goggles D-2 Face Shield
 E-1 Half-Face Respirator, E-2 Full-Face Respirator
 F List type of air-purifying cartridge used
 G Self-Contained Breathing Apparatus (PD or PP)
 H Supplied Air (PD or PP)
 I Other
 J Other

FIGURE A-4 Hazardous Material Access Log

8.0 SITE MONITORING

8.1 Equipment and Instrumentation

a) Air Monitoring Instruments

- Indicate the direct reading air monitoring instruments to be used at the ER remedial project work site:

AIR MONITORING INSTRUMENTS

Type of Instrument	Manufacturer Name and Model Number	Specifications of Instrument	Operation, Maintenance, Repair, and Calibration Procedures Reference
Combustible Gas Indicator			
Oxygen-(O ₂) Indicator			
Carbon Monoxide-(CO) Indicator			
Hydrogen Sulfide-(H ₂ S) Indicator			
Organic Vapor Monitor		[]PID []FID []FID w/GC	
Organic Vapor Monitor		[]PID []FID []FID w/GC	
Infrared Spectrophotometer			
Aerosol Monitor			
Colorimetric Tubes			
Other:			

* A copy of the operation, maintenance, and calibration procedures identified must be provided for each instrument, and kept at the ER remedial project work site for use during operation of the instrument)

b) Radiation and Contamination Survey Instruments

- Indicate the Radiation and Contamination Survey Instruments to be used at the ER remedial project work site:

RADIATION AND CONTAMINATION SURVEY INSTRUMENTS

Type of Instrument	Manufacturer Name and Model Number	Specifications of Instrument	Operation, Maintenance, Repair, and Calibration Procedures Reference

* A copy of the operation, maintenance, and calibration procedures identified must be provided for each instrument, and kept at the ER remedial project work site for use during operation of the instrument)

c) Worker Breathing Zone Sampling

- Indicate the equipment to be used to at the ER remedial project work site to obtain worker breathing zones samples:

WORKER BREATHING ZONE SAMPLING INSTRUMENTS

Type of Instrument	Manufacturer Name and Model Number	Specifications of Instrument	Operation, Maintenance, Repair, and Calibration Procedures Reference*

* A copy of the operation, maintenance, and calibration procedures identified must be provided for each instrument and kept at the ER remedial project work site for use during operation of the instrument)

d) Area Sampling Equipment

- Indicate the Area Sampling Equipment to be used at the ER remedial project work site:

AREA SAMPLING EQUIPMENT

Type of Instrument	Manufacturer Name and Model Number	Specifications of Instrument	Operation, Maintenance, Repair, and Calibration Procedures Reference

* A copy of the operation, maintenance and calibration procedures identified must be provided for each instrument, and kept at the ER remedial project work site for use during operation of the instrument)

e) Physical Hazards Monitoring Equipment

- Indicate the physical hazards monitoring equipment to be used at the ER remedial project work site:

PHYSICAL HAZARDS MONITORING EQUIPMENT

Type of Instrument	Manufacturer Name and Model Number	Specifications of Instrument	Operation, Maintenance, Repair, and Calibration Procedures Reference
Sound Level Meter			
Noise Dosimeter			
Octave Band Analyzer			
Light Meter			
Thermometer			
Wet Bulb Globe Therm.			
Wind Speed Indicator			
Barometer			
Infrared Thermometer			
Microwave Detector			
Volt/Ohm/Cap Meter			
Other:			

* A copy of the operation, maintenance, and calibration procedures identified must be provided for each instrument and kept at the ER remedial project work site for use during operation of the instrument)

8.2 Site Air Monitoring Program

- Indicate the anticipated types and frequency of industrial hygiene monitoring or health physics surveying for each task listed in 3.1. that will provide additional information concerning the hazards on the site and the exposures of workers:

Task # _____

Type of Monitoring/ Surveying	Frequency of Monitoring/ Surveying	Location of Monitoring/ Surveying ¹

¹ Monitoring Locations:

A-Upwind/Downwind of Work

F-Decon Area

B-Support Zone

G-Excavation Area

C-Field Lab Area

H-Underground Storage Tanks

D-Drum Storage

I-Fixed Stations

E-Worker Breathing Zone

J-Other: _____

9.0 ER REMEDIAL PROJECT WORK SITE CONTROL

9.1 Site Map

- A "Site Map" of the ER remedial project work site shall be posted in a conspicuous location in the Support Zone.

- The Site Map should indicate the locations of the following:

- First Aid Stations
- Evacuation Routes
- Fire Control Equipment
- Communications Equipment
- Sanitary Facilities
- Support Facilities

- Additionally, the locations of the current controlled area boundaries shall be clearly marked on the Site Map by the ER SHSC.

9.2 Site work zones

- Work Zones must be established as controlled areas, as necessary, to provide protection for untrained, and/or unprotected personnel.

- The ER SHSC is responsible for erecting boundaries, posting areas, and establishing the entry requirements during work.

9.3 Site communications

- The following systems will be used to provide communications at the ER remedial project work site:

DIRECT COMMUNICATION

- ☐ Radio - FM channel # _____
☐ Megaphone

NOISE MAKERS	USED FOR:	VISUAL SIGNALS	USED FOR:
<input type="checkbox"/> Bell	_____	<input type="checkbox"/> Flag	_____
<input type="checkbox"/> Air Horn	_____	<input type="checkbox"/> Flares/Smoke	_____
<input type="checkbox"/> Siren	_____	<input type="checkbox"/> Hand Signals	_____
<input type="checkbox"/> Whistle	_____	<input type="checkbox"/> Lights	_____
		<input type="checkbox"/> Signal Board	_____
		<input type="checkbox"/> Whole Body Movements	_____

- Additional emergency communication procedures information is contained in the Emergency Response section of the SSHSP.

9.4 Safe Work Practices

- The "Buddy System" will be followed during all work at the ER remedial project work site.

- Additional safe work practices are contained in the following Procedural Manuals to be used at the site for STANDARD OPERATING PPOCEDURES.

Manual Name	Custodian	Location

9.5 Visitors

- Visitors to the ER remedial project work site shall be cleared by the ER Program Manager prior to being granted access to the Support Zone.

- All visitors shall complete the Visitor Briefing required in Section 5, of the HSPP.

- Documentation of the Visitor Briefing shall be completed on Figure A-2 as Site-Specific Training. The SHSC shall retain copies of the training at the ER remedial project work site.

10.0 DECONTAMINATION

10.1 Equipment Decontamination

- List the decontamination steps required for non-sampling equipment and heavy machinery. Specify need for decon solution collection and over-spray control.

Station	Action	Equipment Required
1)	<hr/> <hr/> <hr/>	<hr/> <hr/> <hr/>
2)	<hr/> <hr/> <hr/>	<hr/> <hr/> <hr/>
3)	<hr/> <hr/> <hr/>	<hr/> <hr/> <hr/>
4)	<hr/> <hr/> <hr/>	<hr/> <hr/> <hr/>
5)	<hr/> <hr/> <hr/>	<hr/> <hr/> <hr/>

- List the decontamination steps required for sampling equipment. Specify need for decon solution collection and over-spray control.

Station	Action	Equipment Required
1)	<hr/> <hr/> <hr/>	<hr/> <hr/> <hr/>
2)	<hr/> <hr/> <hr/>	<hr/> <hr/> <hr/>
3)	<hr/> <hr/> <hr/>	<hr/> <hr/> <hr/>
4)	<hr/> <hr/> <hr/>	<hr/> <hr/> <hr/>
5)	<hr/> <hr/> <hr/>	<hr/> <hr/> <hr/>

- List the disposition of decontamination wastes (Provide a description of waste disposition including identification of storage area, hauler, and final disposal site if applicable.)

10.2 Selection of Step-off Decontamination Sequence

- The SHSC is responsible for the proper conduct of the decontamination activities at the ER remedial project work site.

- The Step-off Decontamination Sequences used for PPE levels A through Mod D are provided in Appendix C of the HSWB. Select the sequence necessary for the level of protection specified for the tasks being performed and post them at the decontamination stations.

- Modification to the requirements may be required depending on the work being performed. PEN AND INK modifications shall be made by the SHSC with concurrence of the Health and Safety Liaison Officer.

11.0 EMERGENCY RESPONSE PLAN

11.1 Emergency Contacts and Phone Numbers

- Post this Emergency Contacts and Phone Numbers Table in a conspicuous location at the ER remedial project work site.

Key Person or Agency	Contact Name	Phone Number
Rocky Flats Plant EMT/ Ambulance		4336 (non-emergency) Ext. 2911 (emergency)
Rocky Flats Plant Fire Department		4336 (non-emergency) Ext. 2911 (emergency)
Poison Center		629-1123
Site Health and Safety Coordinator		
Contractor Site Health and Safety Coordinator		
Contractor Field Engineer/Foreman		
ER Health and Safety Officer		
Health and Safety Liaison Officer		
Project Work Site		

- Indicate the evacuation routes to the medical treatment Facility on the "Site Map" posted according to the Section 7, Site Control. Indicate the following information concerning the treatment facility

Travel Time
From Site (Minutes) _____

Distance to
Hospital (Miles) _____

- Indicate on the "Site Map" the areas within the boundaries of the SUPPORT ZONE that are considered Areas of Safe Refuge to be used when evacuation is not possible.

11.2 Medical Emergency Response Plan

- The early warning signs, symptoms, and effects of exposure to the hazardous chemicals that are present at the ER remedial project work site are listed on the Chemical Data Sheets attached to this HSP. List the chemicals and these signs to provide a ready review for the workers at the ER remedial project work sites.

CHEMICAL PRESENT: _____

- Early warning signs/symptoms/effects of exposure:

CHEMICAL PRESENT: _____

- Early warning signs/symptoms/effects of exposure:

CHEMICAL PRESENT: _____

- Early warning signs/symptoms/effects of exposure:

CHEMICAL PRESENT: _____

- Early warning signs/symptoms/effects of exposure:

CHEMICAL PRESENT: _____

- Early warning signs/symptoms/effects of exposure:

CHEMICAL PRESENT: . . . _____

- Early warning signs/symptoms/effects of exposure:

- The following steps shall be taken by workers at the scene of a medical emergency. Actions at the scene will be directed by the "Person-in-charge" upon arrival.

11.3 Fire Response Procedure

- The following steps shall be taken when a fire occurs at the ER remedial project work site.

11.4 Notification and Reporting

- List the steps that shall be taken by the "Person-in-Charge" or a designate for reporting an emergency at the ER remedial project work site to the emergency contacts:

11.5 Equipment

- List the Emergency response equipment that shall be kept at the ER remedial project work site. Indicate with an (*) the equipment that is for emergency use only.

- List the communications equipment that will be used to communicate from the EXCLUSION ZONE to the SUPPORT ZONE. List the communications equipment that will be used to communicate from the ER remedial project work site to the Medical Facility, Fire Department, Shift Superintendent, or Plant Protection Central Station:

COMMUNICATIONS EQUIPMENT	LOCATION

- List the heavy equipment available at the ER remedial project work site to provide assistance in an emergency:

HEAVY EQUIPMENT	LOCATION

- List the types and locations of the First Aid Kits at the ER remedial project work site.

FIRST AID KITS (SPECIFY TYPE)	LOCATION

- List the type and locations of the fire extinguishers at the ER remedial project work site:

FIRE EXTINGUISHERS (SPECIFY TYPE)	LOCATION

- List the locations of the 15-Minute eyewash stations and quickdrench emergency showers at the ER remedial project work site:

EYEWASH STATIONS/ QUICKDRENCH SHOWERS	LOCATION

- List the Personal Protective Equipment kept in reserve for use during an emergency:

PERSONAL PROTECTIVE EQUIPMENT		LOCATION
Type	Amount	

11.6 Emergency Alarms

- List the alarm signals to be used at the ER remedial project work site to notify workers of an emergency situation.

Alarm	Device/sound pattern	Action to be taken
Evacuation		Evacuate the controlled area - or - Move to an area of safe refuge until evacuation can be completed.
Take Cover		Move to an area of safe refuge until "ALL CLEAR" is sounded

12.0 CONFINED SPACE ENTRY

12.1 Introduction

- Confined Space is defined in REFERENCE 2, Procedure 6.04 as:

"An enclosed area that has the following characteristics:

- (1) primary function is something other than human occupancy
- (2) has restricted entry and exit, (entry and exit restrictions will be determined on an individual basis)
- (3) may contain potential or known hazards, e.g. toxic, radioactive, flammable, reactive, or corrosive liquids, solids, and/or vapors
- (4) may contain inert gases of sufficient quantity to displace the air
- (5) may contain physical hazards"

12.2 Evaluation

- Evaluate all tasks to be performed at the ER remedial project work site and list those that are determined to meet the criteria of working in a "confined space".

TASK # (see 3.1)	Confined space to be worked in: (location, description)

- For each task identified to have a confined space entry required obtain a "Confined Space Entry Permit", RF-46368, prior to beginning work.

- The ER SHSC will ensure that the requirements and safe work practices detailed in REFERENCE 2, Procedure 6.04 are followed.

13.0 SPILL CONTAINMENT PROGRAM

13.1 Evaluation

- The spill containment program is required where major spills may occur during drum handling operations. List the tasks, identified in Section 3, that have the potential for causing a major spill.

Task #	Condition that presents the spill hazard

- List the materials at the ER remedial project work site that will be used to contain and isolate the entire volume of the spilled material.

13.2 Spill response on the ER remedial project work site

- List the actions to be taken in the event of a major spill on the ER remedial project work site.

- 1) _____

- 2) _____

- 3) _____

- 4) _____

- 5) _____

6) _____

7) _____

8) _____

9) _____

- REFERENCE 1; *Environmental Restoration Standard Operating Procedures Manual*
- REFERENCE 2; *EG&G Health and Safety Practices Manual (Most Recent Revision)*
- REFERENCE 3; *Federal Facility Agreement and Consent Order (LAG), March 1990*
- REFERENCE 4; 29 CFR 1910.120, *Hazardous Waste Operations and Emergency Response*
- REFERENCE 5; DOE Order 5000.3, *Unusual Occurrence Reporting System*
- REFERENCE 6; DOE Order 5480.1B, *Environmental Safety and Health Program for Department of Energy Operations*
- REFERENCE 7; DOE Order 5480.4, *Environmental Protection, Safety, and Health Protection Standards*
- REFERENCE 8; DOE Order 5480.8, *Contractor Occupational Medical Program*
- REFERENCE 9; DOE Order 5480.9, *Construction Health and Safety Program*
- REFERENCE 10; DOE Order 5480.10, *Contractor Industrial Hygiene Program*
- REFERENCE 11; DOE Order 5480.11, *Radiation Protection for Occupational Workers*
- REFERENCE 12; DOE Order 5483.1A, *Occupational Health and Safety Program for DOE Contractor Employees at Government-Owned, Contractor-Operated Facilities*
- REFERENCE 13; *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*; U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health. October 1985
- REFERENCE 14; 29 CFR 1926, *Safety and Health Regulations For Construction*
- REFERENCE 15; 29 CFR 1910.1000, *Air Contaminants-Permissible Exposure Limits (PELs)*
- REFERENCE 16; *The National Institute For Occupational Safety and Health (NIOSH) "Recommended Exposure Limits (RELs)"*
- REFERENCE 17; *The American Conference of Governmental Industrial Hygienists (ACGIH) "Threshold Limit Values (TLVs)"*
- REFERENCE 18; *ROCKY FLATS Emergency Plan*
- REFERENCE 19; 29 CFR 1910.134, *Respiratory Protection*

ROCKY FLATS PLANT
Environmental Restoration
Health and Safety Program Plan

REFERENCE 20; 29 CFR 1910.141, *Subpart J - General Environmental Controls,
Sanitation*

REFERENCE 21; 29 CFR 1910.20, *Access to Employee Exposure and Medical Records*

APPENDIX B
CHEMICAL DATA SHEETS

BIBLIOGRAPHY

1. *Handbook of Toxic and Hazardous Chemicals and Carcinogens*, Second Edition; Noyes Publications, Park Ridge, NJ; 1985.
2. *Dangerous Properties of Industrial Materials*, Seventh Edition; Van Nostrand Reinhold, NY, 1989.
3. *NIOSH Pocket Guide to Chemical Hazards*, U.S. Department of Health and Human Services, 1985.
4. *Chemical Hazard Response Information System (CHRIS)*, U.S. Department of Transportation, 1984.
5. *Threshold Limit Values and Biological Exposure Indices for 1989-1990*, American Conference of Governmental Industrial Hygienists, Cincinnati, OH, 1989
6. OSHA 3112, *Air Contaminants - Permissible Exposure Limits*, 29 Code of Federal Regulations 1910.1000
7. *Odor Thresholds for Chemical With Established Occupational Health Standards*, American Industrial Hygiene Association, Akron, OH, 1989.

CARBON TETRACHLORIDE

CAS# 56-23-5 RTECS.FG4900000 RCRA WASTE NUMBER. U211
Synonyms: Tetrachloromethane; Perchloromethane; Methane Tetrachloride

	<u>TWA</u>		<u>STEL</u>		<u>CEIL</u>		<u>IDLH</u>		<u>ACTION LEVEL</u>	
	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³
OSHA PEL:	2	12.6	-	-	-	-	300		1	6
NIOSH REL:	-	-	-	-	2	12.6				
ACGIH TLV:	5	31	-	-	-	-				

RESPIRATORY PROTECTION RECOMMENDATIONS ABOVE THE DESIGNATED ACTION LEVEL

- > 1ppm (12.6 mg/M³)
< 50 ppm (630 mg/M³): Full Face Air Purified
w/ Organic Vapor Cart.
- > 50 ppm (630 mg/M³) SCBA -or- Supplied Air
w/ Full face piece
pressure demand -or-
positive pressure

SYMPTOMS:(Inh,Abs,Ing,Contact)

Skin and eye irritation, nausea, vomiting,
central nervous system depression, jaundice

PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS:

CLOTHING: Wear appropriate equipment to prevent repeated/prolonged skin contact.

GOGGLES: When reasonable probability of eye contact exists.

WASH: Promptly when skin becomes contaminated.

CHANGE: N/A

REMOVE: Immediately remove any wetted non-impervious clothing.

RECOMMENDED FIRST AID RESPONSE:

EYES. Immediately wash with large amounts of water (15 minutes), no contact lenses should be worn when working with this chemical.

SKIN. Promptly wash contaminated skin with soap and water, if clothing breakthrough occurs promptly remove clothing and wash skin with soap and water. Get medical attention promptly.

INHALATION: If large amount of chemical is inhaled, remove to fresh air; if breathing has stopped perform rescue breathing. Keep the affected person warm and at rest. Get medical attention as soon as possible.

INGESTION: If chemical is swallowed get medical attention immediately.

IARC Human Carcinogen
NCI-NTP Carcinogen
ACGIH Skin notation
NIOSH Potential Human Carcinogen

Target Organs: Kidney, Liver, Eyes, Skin, Central
Nervous System, Lungs

Colorless, non flammable liquid, forms PHOSGENE
and HYDROGEN CHLORIDE gas in open flame

MF: CCl₄
MW: 153.81 SG. 1.59 VP: 91mm IP 11.47 eV

ODOR THRESHOLD: 250 ppm

ACETONE

CAS#: 67-64-1 RTECS:AL3150000 RCRA WASTE NUMBER: U002
Synonyms: Dimethyl Ketone, 2-Propanone, B-ketopropane

	TWA		STEL		CEIL		IDLH		ACTION LEVEL	
	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³
OSHA PEL:	750	1800	1000	2400	-	-	20,000		375	900
NIOSH REL:	250	590	350	1910	-	-				
ACGIH TLV:	750	1780	1000	2380	-	-				

RESPIRATORY PROTECTION RECOMMENDATIONS ABOVE THE DESIGNATED ACTION LEVEL

> 375ppm (900 mg/M³)
< 18750ppm (45000mg/M³): Full Face
Air Purified
w/ Organic Vapor Cart.

> 18750ppm (45000mg/M³): SCBA -or- Supplied Air
w/ Full face piece
pressure demand -or-
positive pressure

SYMPTOMS:(Inh,Ing,Contact)

Headache, dizziness, irritated eyes,
nose and throat, dermatitis

Target Organs: Skin, respiratory systems, eyes

Colorless liquid, with a sweetish odor

Flammable: UEL:12.8% LEL 2.6%
FlashPoint: 1.4oF

MF: CH₃COCH₃
MW: 58.08 SG. 0.792 VP: 400mm IP: 9.70

ODOR THRESHOLD: 3.6 ppm

PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS:

CLOTHING. Wear appropriate equipment to prevent repeated/prolonged skin contact.

GOGGLES. When reasonable probability of eye contact exists.

WASH: Promptly when skin becomes contaminated.

CHANGE: N/A

REMOVE: Immediately remove any wetted non-impervious clothing.

RECOMMENDED FIRST AID RESPONSE:

EYES. Immediately wash with large amounts of water (15 minutes), no contact lenses should be worn when working with this chemical.

SKIN: Promptly wash contaminated skin with soap and water, if clothing breakthrough occurs promptly remove clothing and wash skin with soap and water. Get medical attention promptly

INHALATION: If large amount of chemical is inhaled, remove to fresh air; if breathing has stopped perform rescue breathing. Keep the affected person warm and at rest. Get medical attention as soon as possible.

INGESTION: If chemical is swallowed get medical attention immediately.

ROCKY FLATS PLANT
Environmental Restoration
Health and Safety Program Plan

CHLOROFORM

CAS#: 67-66-3 RTECS.FS9100000 RCRA WASTE NUMBER. U044
Synonyms: Trichloromethane; TCM; R-20; Methane Trichloride

	TWA		STEL		CEIL		IDLH		ACTION LEVEL	
	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³
OSHA PEL:	2	9.78	-	-	-	-	1000		1	4.5
NIOSH REL:	-	-	-	-	2	9.78				
ACGIH TLV:	10	49	-	-	-	-				

RESPIRATORY PROTECTION RECOMMENDATIONS ABOVE THE DESIGNATED ACTION LEVEL

- > 1ppm (4.5 mg/M³)
< 50 ppm (225 mg/M³): Full Face Air Purified
w/ Organic Vapor Cart.
- > 50 ppm (225 mg/M³) • SCBA -or- Supplied Air
w/ Full face piece
pressure demand -or-
positive pressure

SYMPTOMS:(Inh,Ing,Contact)

Dizziness, lassitude, mental dullness, headache,
fatigue, eye and skin irritation

PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS:

CLOTHING: Wear appropriate equipment to prevent reasonable probability of skin contact.

GOGGLES: When reasonable probability of eye contact exists.

WASH: Promptly when skin becomes contaminated.

CHANGE: N/A

REMOVE: Immediately remove any wetted non-impervious clothing.

RECOMMENDED FIRST AID RESPONSE:

EYES. Immediately wash with large amounts of water (15 minutes), no contact lenses should be worn when working with this chemical.

SKIN: Promptly wash contaminated skin with soap and water, if clothing breakthrough occurs promptly remove clothing and wash skin with soap and water. Get medical attention promptly

INHALATION If large amount of chemical is inhaled, remove to fresh air; if breathing has stopped perform rescue breathing. Keep the affected person warm and at rest. Get medical attention as soon as possible.

INGESTION If chemical is swallowed get medical attention immediately

IARC Animal Carcinogen NCI-NTP Carcinogen NIOSH Potential Human Carcinogen

Target Organs: Kidney, Liver, Eyes, Skin, heart

Colorless liquid, with a characteristic odor
non-flammable, decomposes to HCl, PHOSGENE
and CHLORIDE gas in open flame

MF: CHCl₃

MW: 119.37 SG. 1.498 VP 100mm IP 11.37 °C

ODOR THRESHOLD: 192 ppm

PERCHLOROETHANE

CAS#- 67-72-1 RTECS:KI4025000 RCRA WASTE NUMBER U131
Synonyms: Hexachloroethane, 1,1,1,2,2,2-Hexachloroethane, Carbon Hexachloride

	<u>TWA</u>		<u>STEL</u>		<u>CEIL</u>		<u>IDLH</u>		<u>ACTION LEVEL</u>	
	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³
OSHA PEL:	1	10	-	-	-	-	300		0.5	5
NIOSH REL:	Reduce to lowest feasible limit									
ACGIH TLV:	1	9.7	-	-	-	-				

RESPIRATORY PROTECTION RECOMMENDATIONS ABOVE THE DESIGNATED ACTION LEVEL

- > 0.5 ppm (5 mg/M³)
- < 25 ppm (250 mg/M³) Full Face Air Purified
w/ Organic Vapor Cart.
- > 25 ppm (250 mg/M³) SCBA -or- Supplied Air
w/ Full face piece
pressure demand -or-
positive pressure

SYMPTOMS.(Inh,Ing,Abs,Contact)

Irritate eyes, central nervous system depression

PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS:

- CLOTHING** Wear appropriate equipment to prevent any skin contact.
- GOGGLES** When probability of eye contact exists.
- WASH** Promptly when skin becomes contaminated.
- CHANGE.** If there is any possibility that clothing may be contaminated.
- REMOVE.** Immediately remove any wetted non-impervious clothing.

RECOMMENDED FIRST AID RESPONSE:

- EYES.** Immediately wash with large amounts of water (15 minutes), no contact lenses should be worn when working with this chemical.
- SKIN** Promptly wash contaminated skin with soap and water, if clothing breakthrough occurs promptly remove clothing and wash skin with soap and water. Get medical attention promptly.
- INHALATION** If large amount of chemical is inhaled, remove to fresh air; if breathing has stopped perform rescue breathing. Keep the affected person warm and at rest. Get medical attention as soon as possible.

IARC Animal Carcinogen
NCI-NTP Carcinogen
ACGIH Skin notation
NIOSH Potential Human Carcinogen

Target Organs: Eyes

Colorless solid with a camphor-like odor

MF Cl₂CCl₃
MW 236.74 VP- 22mm IP- 11.10eV

ODOR THRESHOLD 47 ppm, Olfactory Fatigue

BENZENE

CAS# 71-43-2 RTECS.CY1400000 RCRA WASTE NUMBER U019
Synonyms: Benzol, Coal Tar Naphtha

	TWA		STEL		CEIL		IDLH		ACTION LEVEL	
	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³
OSHA PEL:	1	-	5	-	-	-	2000	-	0.5	1.6
NIOSH REL:	0.1	.32	1	3.2	-	-				
ACGIH TLV:	10	32	-	-	-	-				

RESPIRATORY PROTECTION RECOMMENDATIONS ABOVE THE DESIGNATED ACTION LEVEL

>0.5 ppm (1.6 mg/M³)
<25 ppm (80 mg/M³) - Full Face Air Purified
w/ Organic Vapor Cart.
>25 ppm (80 mg/M³) - SCBA -or- Supplied Air
w/ Full face piece
pressure demand -or-
positive pressure

SYMPTOMS:(Inh,Ing,Abs,Contact)

Irritate eyes, nose, respiratory system, giddy, headache,
nausea, staggered gait, fatigue, lassitude, dermatitis,
abdominal pain, bone marrow depression

PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS:

CLOTHING Wear appropriate equipment to prevent any skin contact

GOGGLES. When probability of eye contact exists.

WASH: Promptly when skin becomes contaminated.

CHANGE. N/A

REMOVE: Immediately remove any wetted non-impervious clothing.

RECOMMENDED FIRST AID RESPONSE:

EYES. Immediately wash with large amounts of water (15 minutes), no contact lenses should be worn when working with this chemical.

SKIN. Promptly wash contaminated skin with soap and water, if clothing breakthrough occurs promptly remove clothing and wash skin with soap and water. Get medical attention promptly.

INHALATION If large amount of chemical is inhaled, remove to fresh air; if breathing has stopped perform rescue breathing. Keep the affected person warm and at rest. Get medical attention as soon as possible.

INGESTION If chemical is swallowed get medical attention immediately

IARC Human Carcinogen NCI-NTP Carcinogen OSHA/ACGIH Skin notation NIOSH Potential Human Carcinogen

Target Organs: Blood, Skin, Eyes, Central Nervous
System, Marrow, Respiratory system

Clear, volatile, colorless, highly flammable liquid with
characteristic odor. Poisonous gases produced in fire

FLAMMABLE. UEL - 7.1% LEL - 1.3%

Flashpoint. 120F

MF: C₆H₆

MW 78.11 SG 0.879 VP 100mm IP 9.24 eV

ODOR THRESHOLD: 61 ppm

1,1,1 - TRICHLOROETHANE

CAS# 71-55-6 RTECS.KJ2975000 RCRA WASTE NUMBER. U226
Synonyms: Methyl Chloroform, 1,1,1-TCE, Chloroethene

	<u>TWA</u>		<u>STEL</u>		<u>CEIL</u>		<u>IDLH</u>		<u>ACTION LEVEL</u>	
	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³
OSHA PEL:	350	1900	450	2450	-	-	1000		200	560
NIOSH REL:	-	-	350	1910	-	-				
ACGIH TLV:	350	1910	450	2460	-	-				

RESPIRATORY PROTECTION RECOMMENDATIONS ABOVE THE DESIGNATED ACTION LEVEL

> 200ppm (560 mg/M³)
< 1000 ppm (28000mg/M³). Full Face
Air Purified
w/ Organic Vapor Cart.

> 1000 ppm (28000mg/M³) SCBA -or- Supplied Air
w/ Full face piece
pressure demand -or-
positive pressure

SYMPTOMS:(Inh,Ing,Contact)

Central nervous system depression, headache,
lassitude, poor equilibrium irritate eyes, dermatitis,
Skin and eye irritation, nausea, vomiting.

Exposure causes cardiac arrhythmias,
and possible congenital abnormalities

Target Organs: Skin, Central Nervous/
CNS systems, eyes

Combustible: UEL- 16.0% LEL- 7.0%

Colorless liquid, toxic gases produced in fire

MF- C₂H₃Cl₃
MW- 133.40 SG 1.33761 VP 100mm IP n/a

ODOR THRESHOLD 390 ppm

PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS:

CLOTHING Wear appropriate equipment to prevent repeated/prolonged skin contact.

GOGGLES. When reasonable probability of eye contact exists.

WASH: Promptly when skin becomes contaminated.

CHANGE. N/A

REMOVE: Immediately remove any wetted non-impervious clothing.

RECOMMENDED FIRST AID RESPONSE:

EYES Immediately wash with large amounts of water (15 minutes), no contact lenses should be worn when working with this chemical.

SKIN Promptly wash contaminated skin with soap and water, if clothing breakthrough occurs promptly remove clothing and wash skin with soap and water. Get medical attention promptly

INHALATION If large amount of chemical is inhaled, remove to fresh air, if breathing has stopped perform rescue breathing. Keep the affected person warm and at rest. Get medical attention as soon as possible.

INGESTION If chemical is swallowed get medical attention immediately

ROCKY FLATS PLANT
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DICHLOROMETHANE

CAS# 75-09-2 RTECS.PA8050000 RCRA WASTE NUMBER U080
 Synonyms: Methylene Chloride; Methane Dichloride, Freon 30;

	<u>TWA</u>		<u>STEL</u>		<u>CEIL</u>		<u>IDLH</u>		<u>ACTION LEVEL</u>	
	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³
OSHA PEL:	500	-	1000	-	2000	-	5000	-	25	-
NIOSH REL:	Reduce to the lowest feasible limit									
ACGIH TLV:	50	-	174	-	-	-				

RESPIRATORY PROTECTION RECOMMENDATIONS ABOVE THE DESIGNATED ACTION LEVEL

- > 25 ppm
 < 1250 ppm Full Face Air Purified
 w/ Organic Vapor Cart.
- > 1250 ppm SCBA -or- Supplied Air
 w/ Full face piece
 pressure demand -or-
 positive pressure

SYMPTOMS:(Inh.Ing.Abs.Contact)
 Skin and eye irritation, intoxication, headache,
 giddiness, stupor, irritability, numbness, tingling in
 limbs

PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS:

- CLOTHING** Wear appropriate equipment to prevent repeated/prolonged skin contact.
- GOGGLES** When reasonable probability of eye contact exists.
- WASH:** Promptly when skin becomes contaminated.
- CHANGE.** N/A
- REMOVE.** Immediately remove any wetted non-impervious clothing.

RECOMMENDED FIRST AID RESPONSE:

- EYES.** Immediately wash with large amounts of water (15 minutes), no contact lenses should be worn when working with this chemical.
- SKIN** Promptly wash contaminated skin with soap and water, if clothing breakthrough occurs promptly remove clothing and wash skin with soap and water Get medical attention promptly
- INHALATION** If large amount of chemical is inhaled, remove to fresh air; if breathing has stopped perform rescue breathing. Keep the affected person warm and at rest Get medical attention as soon as possible.
- INGESTION** If chemical is swallowed get medical attention immediately

IARC Animal Carcinogen NCI-NTP Carcinogen NIOSH Potential Human Carcinogen

Target Organs Eyes, Skin, Central Nervous System
 Cardiovascular system

Clear, colorless, non flammable liquid with a
 penetrating ether-like odor

MF: CH₂Cl₂
 MW 84.94 SG 1.33 VP 380mm IP 11.32 ev

ODOR THRESHOLD 160 ppm

1,1 - DICHLOROETHENE

CAS#- 75-35-4 RTECS.KV9275000 RCRA WASTE NUMBER: U078
Synonyms: Vinylidene Chloride; 1,1-Dichloroethylene; 1,1-DCE, DCE

	<u>TWA</u>		<u>STEL</u>		<u>CEIL</u>		<u>IDLH</u>		<u>ACTION LEVEL</u>	
	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³
OSHA PEL:	1	4	-	-	-	-	-	-	0.5	2
NIOSH REL:	-	-	-	-	-	-	-	-	-	-
ACGIH TLV:	5	20	20	79	-	-	-	-	-	-

RESPIRATORY PROTECTION RECOMMENDATIONS ABOVE THE DESIGNATED ACTION LEVEL

>0.5ppm (2 mg/M³)
<25 ppm (100 mg/M³): Full Face Air Purified
w/ Organic Vapor Cart.

> 25 ppm (100 mg/M³) SCBA -or- Supplied Air
w/ Full face piece
pressure demand -or-
positive pressure

SYMPTOMS:(Inh,Ing)

Central nervous system depression, dizziness, high
levels can cause anesthesia.

IARC Animal Carcinogen

Target Organs: Kidney, Liver, Skin, Central Nervous
System

Volatile liquid with mild sweet odor Poisonous gases
produced in fire.

FLAMMABLE. UEL- 16.0% Flashpoint 0oF
LEL- 7.3%

MF: CH₂=CCl₂

MW- 96.94 SG. 1.21 VP- 591mm IP N/A

PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS:

CLOTHING Wear appropriate equipment to prevent repeated/prolonged skincontact.

GOGGLES. When reasonable probability of eye contact exists.

WASH: Promptly when skin becomes contaminated.

CHANGE: N/A

REMOVE. Immediately remove any non-impervious clothing that becomes wet.

RECOMMENDED FIRST AID RESPONSE:

EYES. Immediately wash with large amounts of water (15 minutes), no contact lenses should be worn
when working with this chemical.

SKIN. Promptly wash contaminated skin with soap and water, if clothing breakthrough occurs
promptly remove clothing and wash skin with soap and water. Get medical attention promptly

INHALATION. If large amount of chemical is inhaled, remove to fresh air; if breathing has stopped perform
rescue breathing. Keep the affected person warm and at rest. Get medical attention as soon
as possible.

INGESTION: If chemical is swallowed get medical attention immediately.

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2-BUTANONE

CAS#: 78-93-3 RTECS:EL6475000 RCRA WASTE NUMBER: U159
Synonyms: Methyl Ethyl Ketone, Ethyl Methyl Ketone, MEK, Methyl Acetone

	TWA		STEL		CEIL		IDLH		ACTION LEVEL	
	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³
OSHA PEL:	200	590	300	885	-	-	3000		100	295
NIOSH REL:	200	590	-	-	-	-				
ACGIH TLV:	200	590	300	885	-	-				

RESPIRATORY PROTECTION RECOMMENDATIONS ABOVE THE DESIGNATED ACTION LEVEL

> 100 ppm (295 mg/M³)
< 3000ppm (8850mg/M³) Full Face Air Purified
w/ Organic Vapor Cart.

> 3000ppm (8850mg/M³): SCBA -or- Supplied Air
w/ Full face piece
pressure demand -or-
positive pressure

SYMPTOMS:(Inh,Abs,Ing,Contact)

Eve and nose irritation, headache, dizziness, vomiting.

Target organs: Central Nervous System, Lungs

Clear, colorless liquid with a fragrant, mint-like,
moderately sharp odor Flammable liquid.

Flammable: UEL -11.5% LEL -1.3% Flashpoint 22 F

MF: C₄H₈O
MW: 72.12 SG 0.806 VP 71.2mm IP 9.51

Odor Threshold: 16 ppm

PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS:

CLOTHING Wear appropriate equipment to prevent repeated/prolonged skin contact.

GOGGLES. When reasonable probability of eye contact exists.

WASH: Promptly when skin becomes contaminated.

CHANGE. N/A

REMOVE: Immediately remove any wetted non-impervious clothing.

RECOMMENDED FIRST AID RESPONSE:

EYES. Immediately wash with large amounts of water (15 minutes), no contact lenses should be worn when working with this chemical.

SKIN: Promptly wash contaminated skin with soap and water, if clothing breakthrough occurs promptly remove clothing and wash skin with soap and water. Get medical attention promptly.

INHALATION. If large amount of chemical is inhaled, remove to fresh air; if breathing has stopped perform rescue breathing. Keep the affected person warm and at rest. Get medical attention as soon as possible.

INGESTION If chemical is swallowed get medical attention immediately.

TRICHLOROETHENE

CAS#: 79-01-6 RTECS:KX4550000 RCRA WASTE NUMBER. U228
Synonyms: Ethylene trichloride; Trichloroethylene, Triclene, TCE

	<u>TWA</u>		<u>STEL</u>		<u>CEIL</u>		<u>IDLH</u>		<u>ACTION LEVEL</u>	
	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³
OSHA PEL:	50	270	200	1080	-	-	1000		25	135
NIOSH REL:	25 (10hr)		-	-	-	-				
ACGIH TLV:	50	269	200	1070	-	-				

RESPIRATORY PROTECTION RECOMMENDATIONS ABOVE THE DESIGNATED ACTION LEVEL

- > 25ppm (135 mg/M³)
< 1000ppm (6750 mg/M³) Full Face Air Purified
w/ Organic Vapor Cart.
- > 1000ppm (6750mg/M³) SCBA -or- Supplied Air
w/ Full face piece
pressure demand -or-
positive pressure

SYMPTOMS:(Inh,Abs,Ing,Contact)

Headache, vertigo, visual disturbance, tremors,
sleepiness, nausea, vomiting, eye irritation, dermatitis,
paresthesia

PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS:

CLOTHING. Wear appropriate equipment to prevent repeated/prolonged skin contact

GOGGLES. When reasonable probability of eye contact exists.

WASH. Promptly when skin becomes contaminated.

CHANGE: N/A

REMOVE: Immediately remove any wetted non-impervious clothing.

RECOMMENDED FIRST AID RESPONSE:

EYES. Immediately wash with large amounts of water (15 minutes), no contact lenses should be worn when working with this chemical.

SKIN Promptly wash contaminated skin with soap and water, if clothing breakthrough occurs promptly remove clothing and wash skin with soap and water. Get medical attention promptly

INHALATION. If large amount of chemical is inhaled, remove to fresh air, if breathing has stopped perform rescue breathing. Keep the affected person warm and at rest. Get medical attention as soon as possible.

INGESTION. If chemical is swallowed get medical attention immediately

IARC Suspected Animal Carcinogen NCI-NTP Carcinogen NIOSH Potential Human Carcinogen

Target Organs: Heart, Kidney, Liver, Skin, Central Nervous System, Respiratory System

UEL 90% LEL 12.5%

Colorless, non flammable liquid, non-corrosive liquid with a sweet odor.

MF: C₂HCl₃ = CCL₂

MW: 131.38 SG 1.45 VP 58mm IP: 9.45 eV

ODOR THRESHOLD: 32 ppm

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1,2 - DICHLOROETHANE

CAS#:107-06-2 RTECS:KI0525000 RCRA WASTE NUMBER: U077
 Synonyms: Ethylene Dichloride; Glycol Dichloride; Ethylene chloride

	<u>TWA</u>		<u>STEL</u>		<u>CEIL</u>		<u>IDLH</u>		<u>ACTION LEVEL</u>	
	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³
OSHA PEL:	1	4	2	8	-	-	1000		0.5	2
NIOSH REL:	1	4	2	8	-	-				
ACGIH TLV:	10	40	-	-	-	-				

(Note:REL-TWA for 10 hr)

RESPIRATORY PROTECTION RECOMMENDATIONS ABOVE THE DESIGNATED ACTION LEVEL

>0.5ppm (2 mg/M³)
 <25 ppm (100 mg/M³) Full Face Air Purified
 w/ Organic Vapor Cart.

>25 ppm (100 mg/M³) SCBA -or- Supplied Air
 w/ Full face piece
 pressure demand -or-
 positive pressure

SYMPTOMS:(Inh,Abs,Ing,Contact)

Nausea, Vomiting, Dermatitis, eye irritation, central
 nervous system depression, fluid in lungs

PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS:

CLOTHING: Wear appropriate equipment to prevent any skin contact.

GOGGLES: When reasonable probability of eye contact exists.

WASH: Promptly when skin becomes contaminated.

CHANGE: N/A

REMOVE: Immediately remove any wetted non-impervious clothing.

RECOMMENDED FIRST AID RESPONSE:

EYES: Immediately wash with large amounts of water (15 minutes), no contact lenses should be worn
 when working with this chemical.

SKIN: Promptly wash contaminated skin with soap and water, if clothing breakthrough occurs
 promptly remove clothing and wash skin with soap and water Get medical attention promptly

INHALATION: If large amount of chemical is inhaled, remove to fresh air; if breathing has stopped perform
 rescue breathing. Keep the affected person warm and at rest. Get medical attention as soon
 as possible.

INGESTION If chemical is swallowed get medical attention immediately

IARC Suspected Human Carcinogen NCI-NTP Carcinogen NIOSH Potential Human Carcinogen

Target Organs: Kidney, Liver, Eyes, Skin, Cardio-
 vascular, Respiratory, and Central Nervous Systems

FLAMMABLE. UEL- 15.9% LEL- 6.2%

Flashpoint: 55oF

Colorless liquid with a pleasant odor poisonous
 gases produced in fire.

MF-CICH₂CH₂Cl

MW-98.96 SG. 1.253 VP 68mm IP 11.12eV

ODOR THRESHOLD- 26 ppm

ETHYLENE GLYCOL

CAS# 107-21-1 RTECS.KW2975000 RCRA WASTE NUMBER: N/A
Synonyms: Monoethylene Glycol, MEG, Ethylene Alcohol

	<u>TWA</u>		<u>STEL</u>		<u>CEIL</u>		<u>IDLH</u>		<u>ACTION LEVEL</u>	
	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³
OSHA PEL:	-	-	-	-	-	-			25	63
NIOSH REL:	-	-	-	-	-	-				
ACGIH TLV:	-	-	-	-	50	127	(ACGIH CEIL for VAPOR)			

Note: These levels are maximum for 15 minutes or less

RESPIRATORY PROTECTION RECOMMENDATIONS ABOVE THE DESIGNATED ACTION LEVEL

- > 25 ppm (63 mg/M³)
< 1250ppm (3150 mg/M³) Full Face Air Purified
w/ Organic Vapor Cart.
- > 1250ppm (3150 mg/M³) SCBA -or- Supplied Air
w/ Full face piece
pressure demand -or-
positive pressure

Target organs: Central nervous and cardiovascular
systems

Colorless, odorless, viscous liquid with a sweetish
taste

MF: HOCH₂CH₂OH
MW: 62.08 SG 1.113 VP 0.05mm

SYMPTOMS:(Inh,Ing,Abs.)

When Heated - central nervous system depression,
anorexia, depression, respiratory cardiac failure

PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS:

CLOTHING. Respiratory protection in areas of vapor concentration.

GOGGLES. N/A

WASH. N/A

CHANGE. N/A

REMOVE: N/A

RECOMMENDED FIRST AID RESPONSE:

EYES Immediately wash with large amounts of water (15 minutes), no contact lenses should be worn
when working with this chemical.

SKIN Wash contaminated skin with soap and water.

INHALATION If large amount of chemical is inhaled, remove to fresh air; if breathing has stopped perform
rescue breathing. Keep the affected person warm and at rest. Get medical attention as soon
as possible.

INGESTION. If chemical is swallowed get medical attention immediately

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TOLUENE

CAS#: 108-88-1 RTECS.XS5250000 RCRA WASTE NUMBER. U220
Synonyms: Methylbenzene, Phenylmethane, Toluol

	TWA		STEL		CEIL		IDLH		ACTION LEVEL	
	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³
OSHA PEL:	100	375	150	560	-	-	2000		50	199
NIOSH REL:	100	375	200	750	-	-				
ACGIH TLV:	100	377	150	565	-	-	Note (REL-STEL:10 Min.)			

RESPIRATORY PROTECTION RECOMMENDATIONS ABOVE THE DESIGNATED ACTION LEVEL

- > 50ppm (188 mg/M³)
< 2000 ppm (7500 mg/M³) Full Face
Air Purified
w/ Organic Vapor Cart
- > 2000 ppm (7500 mg/M³) SCBA -or- Supplied Air
w/ Full face piece
pressure demand -or-
positive pressure

SYMPTOMS:(Inh,Abs,Ing,Contact)

Fatigue, weakness, confusion, dermatitis, euphoria,
dizziness, headache, dilated pupils, lacrimation,
nervousness, muscle fatigue, insomnia, paresthesia,
photophobia

PERSONAL PROTECTIVE

EQUIPMENT REQUIREMENTS:

CLOTHING. Wear appropriate equipment to prevent repeated/prolonged skin contact

GOGGLES. When reasonable probability of eye contact exists.

WASH. Promptly when skin becomes contaminated.

CHANGE: N/A

REMOVE: Immediately remove any wetted non-impervious clothing.

RECOMMENDED FIRST AID RESPONSE:

EYES. Immediately wash with large amounts of water (15 minutes), no contact lenses should be worn when working with this chemical.

SKIN: Promptly wash contaminated skin with soap and water, if clothing breakthrough occurs promptly remove clothing and wash skin with soap and water. Get medical attention promptly.

INHALATION: If large amount of chemical is inhaled, remove to fresh air; if breathing has stopped perform rescue breathing. Keep the affected person warm and at rest. Get medical attention as soon as possible.

INGESTION: If chemical is swallowed get medical attention immediately.

Target organs: Kidney, Liver, Skin.

Central Nervous system

Clear, colorless, noncorrosive liquid with a sweet
pungent, benzene-like odor

FLAMMABLE. UEL -7.1% LEL -1.3%

Flashpoint: 40oF

Vapors could cause explosion hazard

MF: C₇H₈

MW: 92.13 SG: 0.867 VP: 36.7mm IP 3.82 eV

ODOR THRESHOLD: 1.6 ppm

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BIS-(2-ETHYLHEXYL)PHTHALATE

CAS#-117-81-7 RTECS.T10350000 RCRA WASTE NUMBER: U028
Synonyms: di-sec-octyl phthalate; Di-2-Ethylhexyl phthalate; DOP; DEHP

	TWA		STEL		CEIL		IDLH		ACTION LEVEL	
	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³
OSHA PEL:	-	5	-	10	-	-	-	-	-	2.5
NIOSH REL:	Reduce to lowest feasible limit									
ACGIH TLV:	-	5	-	10	-	-	-	-	-	-

RESPIRATORY PROTECTION RECOMMENDATIONS ABOVE THE DESIGNATED ACTION LEVEL

> 2.5 mg/M³
< 125 mg/M³ Full Face Air Purified
w/ Organic Vapor Cart.

> 125 mg/M³ SCBA -or- Supplied Air
w/ Full face piece
pressure demand -or-
positive pressure

SYMPTOMS:(Inh,Ing,Contact)

Irritated eyes, mucous membranes, nausea, diarrhea

PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS:

CLOTHING. N/A

GOGGLES When reasonable probability of eye contact exists.

WASH: N/A

CHANGE: N/A

REMOVE: N/A

RECOMMENDED FIRST AID RESPONSE:

EYES: Immediately wash with large amounts of water (15 minutes), no contact lenses should be worn when working with this chemical.

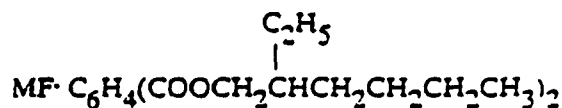
SKIN Wash contaminated skin with soap and water regularly.

INHALATION: If large amount of chemical is inhaled, remove to fresh air; if breathing has stopped perform rescue breathing. Keep the affected person warm and at rest. Get medical attention as soon as possible.

INGESTION. If this chemical is swallowed get medical attention immediately.

IARC Animal Carcinogen NCI-NTP Carcinogen NIOSH Potential Human Carcinogen

Target Organs: Eyes, Upper Respiratory System,
GI tract
Colorless oily liquid with almost no odor



MW 390 SG 0.98 VP 1.2 IP n/a

TETRACHLOROETHYLENE

CAS#: 127-18-4 RTECS: KX3850000 RCRA WASTE NUMBER: U210
Synonyms: Perchloroethylene; 1,1,2,2-Tetrachloroethylene; Perk

	<u>TWA</u>		<u>STEL</u>		<u>CEIL</u>		<u>IDLH</u>		<u>ACTION LEVEL</u>	
	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³
OSHA PEL:	25	170	-	-	-	-	500		12.5	85
NIOSH REL:	Reduce to lowest feasible limit									
ACGIH TLV:	50	339	200	1370	-	-				

RESPIRATORY PROTECTION RECOMMENDATIONS ABOVE THE DESIGNATED ACTION LEVEL

- > 12.5ppm (85mg/M³)
< 500ppm (3400 mg/M³) Full Face Air Purified
w/ Organic Vapor Cart.
- > 500ppm (3400 mg/M³) SCBA -or- Supplied Air
w/ Full face piece
pressure demand -or-
positive pressure

SYMPTOMS: (Inh, Ing, Abs, Contact)

Irritate eyes, nose, throat, nausea, flush face/neck,
vertigo, dizziness, incoherent, headache, Jaundice

IARC Animal Carcinogen NCI-NTP Carcinogen NIOSH Potential Human Carcinogen

Target Organs: Kidney, Liver, Eves. Upper Resp
and Central Nervous system

Clear, colorless, non-flammable liquid with a
characteristic odor. Poisonous gas may be produced
in fire.

MF-Cl₂C=CCl₂
MW- 165.82 SG- 1.63 VP- 14mm IP 9.32 eV

ODOR THRESHOLD- 47 ppm, Olfactory Fatigue

PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS:

CLOTHING. Wear appropriate equipment to prevent repeated/prolonged skin contact.

GOGGLES. When reasonable probability of eye contact exists.

WASH: Promptly when skin becomes contaminated.

CHANGE: N/A

REMOVE. Immediately remove any wetted non-impervious clothing.

RECOMMENDED FIRST AID RESPONSE:

EYES. Immediately wash with large amounts of water (15 minutes), no contact lenses should be worn
when working with this chemical.

SKIN: Promptly wash contaminated skin with soap and water, if clothing breakthrough occurs
promptly remove clothing and wash skin with soap and water. Get medical attention promptly.

INHALATION: If large amount of chemical is inhaled, remove to fresh air, if breathing has stopped perform
rescue breathing. Keep the affected person warm and at rest. Get medical attention as soon
as possible.

INGESTION. If chemical is swallowed get medical attention immediately.

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Environmental Restoration
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1,2 - DICHLOROETHENE

CAS#: 540-59-0 RTECS.KV9360000 RCRA WASTE NUMBER. Trans-U079
Synonyms: Acetylene dichloride; 1,2-Dichloroethylene; 1,2-DCE; sym-Dichloroethene

	<u>TWA</u>		<u>STEL</u>		<u>CEIL</u>		<u>IDLH</u>		<u>ACTION LEVEL</u>	
	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³
OSHA PEL:	200	790	-	-	-	-	4000		100	395
NIOSH REL:	-	-	-	-	-	-				
ACGIH TLV:	200	793	-	-	-	-				

RESPIRATORY PROTECTION RECOMMENDATIONS ABOVE THE DESIGNATED ACTION LEVEL

> 100ppm (395 mg/M³)
< 4000ppm (15,800mg/M³) • Full Face
Air Purified
w/ Organic Vapor Cart.

> 4000ppm (15,800mg/M³) SCBA-or-Supplied Air
w/ Full face piece
pressure demand -or-
positive pressure

SYMPTOMS: (Inh, Abs, Ing, Contact)
Skin irritation, drowsiness, central nervous system
depression

Trans-1,2-DCE makes up 40% of total

Cis-1,2-DCE makes up 60% of total

Target Organs: Kidneys, Liver, Skin, Central Nervous System

FLAMMABLE: UEL- 12.8% Flashpoint:
LEL- 9.7% 36-39°F

Liquid with slightly acid, ethereal odor gradual
decomposition to HCl.

MF: ClCH=CHCl
MW: 96.94 SG. 1.27 VP-180-265 mm IP 9.65

PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS:

CLOTHING. Wear appropriate equipment to prevent repeated/prolonged skin contact.

GOGGLES. When reasonable probability of eye contact exists.

WASH. Promptly when skin becomes contaminated.

CHANGE. N/A

REMOVE: Immediately remove any wetted non-impervious clothing.

RECOMMENDED FIRST AID RESPONSE:

EYES. Immediately wash with large amounts of water (15 minutes), no contact lenses should be worn when working with this chemical.

SKIN. Promptly wash contaminated skin with soap and water, if clothing breakthrough occurs promptly remove clothing and wash skin with soap and water. Get medical attention promptly

INHALATION. If large amount of chemical is inhaled, remove to fresh air; if breathing has stopped perform rescue breathing. Keep the affected person warm and at rest. Get medical attention as soon as possible.

INGESTION. If chemical is swallowed get medical attention immediately.

ROCKY FLATS PLANT
Environmental Restoration
Health and Safety Program Plan

XYLENE

CAS# 1330-20-7 RTECS.ZE2100000 RCRA WASTE NUMBER. U239
 Synonyms: Dimethylbenzene, Methyl Toulene, Violet 3, Xylol

	TWA		STEL		CEIL		IDLH		ACTION LEVEL	
	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³
OSHA PEL:	100	435	150	655	-	-	10,000		50	217
NIOSH REL:	100	434	200	868	-	-				
ACGIH TLV:	100	434	150	651	-	-	Note (REL-STEL 10 Min)			

RESPIRATORY PROTECTION RECOMMENDATIONS ABOVE THE DESIGNATED ACTION LEVEL

> 50ppm (217 mg/M³)
 <2500 ppm (10850mg/M³) Full Face
 Air Purified
 w/ Organic Vapor Cart.

> 2500 ppm (10850mg/M³) SCBA -or- Supplied Air
 w/ Full face piece
 pressure demand -or-
 positive pressure

SYMPTOMS.(Inh.Abs,Ing.Contact)

Dizziness, excitement, drowsiness, incoherent, staggered gait,
 irritated eyes, nose, and throat, corneal vacuolization, anorexia,
 nausea, vomiting, abdominal pain, dermatitis.

Target Organs: Central Nervous System, eyes
 GI tract, blood, liver, kidneys, skin

Colorless, flammable liquid with a aromatic odor

FLAMMABLE: UEL -6.0% LEL -1.0%
 Flashpoint: 81oF

Vapors could cause explosion hazard.

MF: C₈H₁₀
 MW: 106.18 SG. 0.864 VP: 6.72mm IP 88.2 cV

ODOR THRESHOLD 20 ppm

PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS.

CLOTHING. Wear appropriate equipment to prevent repeated/prolonged skin contact.

GOGGLES. When reasonable probability of eye contact exists.

WASH Promptly when skin becomes contaminated.

CHANGE N/A

REMOVE Immediately remove any wetted non-impervious clothing.

RECOMMENDED FIRST AID RESPONSE:

EYES. Immediately wash with large amounts of water (15 minutes), no contact lenses should be worn
 when working with this chemical.

SKIN Promptly wash contaminated skin with soap and water, if clothing breakthrough occurs
 promptly remove clothing and wash skin with soap and water. Get medical attention promptly

INHALATION If large amount of chemical is inhaled, remove to fresh air; if breathing has stopped perform
 rescue breathing. Keep the affected person warm and at rest. Get medical attention as soon
 as possible.

INGESTION If chemical is swallowed get medical attention immediately

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METHYL ETHYL KETONE PEROXIDE

CAS# 1338-23-4 RTECS.EL9450000 RCRA WASTE NUMBER: U160
Synonyms: MEK Peroxide, Methylethylketonehydroperoxide, Lupersol

	<u>TWA</u>		<u>STEL</u>		<u>CEIL</u>		<u>IDLH</u>		<u>ACTION LEVEL</u>	
	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³
OSHA PEL:	-	-	-	-	0.7	5			0.1	0.75
NIOSH REL:	-	-	-	-	-	-				
ACGIH TLV:	-	-	-	-	0.2	1.5				

RESPIRATORY PROTECTION RECOMMENDATIONS ABOVE THE DESIGNATED ACTION LEVEL

- > 0.1 ppm (0.75 mg/M³)
- < 5 ppm (37.5 mg/M³): Full Face Air Purified
w/ Organic Vapor Cart.
- > 5 ppm (37.5 mg/M³): SCBA -or- Supplied Air
w/ Full face piece
pressure demand -or-
positive pressure

SYMPTOMS.(Inh,Abs,Ing,Contact)

Severe skin and eye irritation, nausea, vomiting.
Chemical burns of GI track

Target organs: Skin, eyes, intestinal system

Colorless Liquid
Shock Sensitive Explosive

MF: C₈H₁₆O₄
MW: 176.24

PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS:

- CLOTHING. Wear appropriate equipment to prevent repeated/prolonged skin contact.
- GOGGLES. When reasonable probability of eye contact exists.
- WASH. Promptly when skin becomes contaminated.
- CHANGE: N/A
- REMOVE: Immediately remove any wetted non-impervious clothing.

RECOMMENDED FIRST AID RESPONSE:

- EYES Immediately wash with large amounts of water (15 minutes), no contact lenses should be worn when working with this chemical.
- SKIN Promptly wash contaminated skin with soap and water, if clothing breakthrough occurs promptly remove clothing and wash skin with soap and water. Get medical attention promptly
- INHALATION. If large amount of chemical is inhaled, remove to fresh air; if breathing has stopped perform rescue breathing. Keep the affected person warm and at rest. Get medical attention as soon as possible.
- INGESTION If chemical is swallowed get medical attention immediately.

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HYDROFLUORIC ACID

CAS#: 7664-39-3 RTECS.MW7875000 RCRA WASTE NUMBER: U134
Synonyms: Hydrogen Fluoride, Anhydrous Hydrofluoric Acid, HF

	<u>TWA</u>		<u>STEL</u>		<u>CEIL</u>		<u>IDLH</u>		<u>ACTION LEVEL</u>	
	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³
OSHA PEL:	3	-	6	-	-	-	20	-	1.5	-
NIOSH REL:	-	2.5 (mg F)	-	5.0 (mg F)	-	-	-	-	-	-
ACGIH TLV:	-	-	-	-	3	2.6	-	-	-	-

RESPIRATORY PROTECTION RECOMMENDATIONS ABOVE THE DESIGNATED ACTION LEVEL

> 1.5 ppm
< 75 ppm • Full Face Air Purified
 w/ Acid Gas Cartridge

> 75 ppm SCBA -or- Supplied Air
 w/ Full face piece, pressure demand
 -or- positive pressure.

SYMPTOMS:(Inh,Ing,Contact)

Irritation and burns of the eyes, nose, and throat, nasal
congestion, bronchitis.

Corrosive Material -- DOT label "CORROSIVE"

Target Organs: Respiratory system, Eyes, Skin

Colorless, fuming, liquid or gas with a strong
irritating odor

MF: HF
MW: 20 SG: 0.901 VP: 400mm

ODOR THRESHOLD none

PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS:

CLOTHING. Wear appropriate equipment to prevent any skin contact.

GOGGLES When any probability of eye contact exists.

WASH: Immediately when skin becomes contaminated.

CHANGE: N/A

REMOVE: Immediately remove any wetted non-impervious clothing.

RECOMMENDED FIRST AID RESPONSE:

EYES. Immediately wash with large amounts of water (15 minutes), no contact lenses should be worn when working with this chemical.

SKIN. If this chemical comes in contact with the skin, immediately flush the contaminated skin with water, if clothing breakthrough occurs promptly remove clothing and flush skin with water. Get medical attention promptly.

INHALATION If large amount of chemical is inhaled, remove to fresh air; if breathing has stopped perform rescue breathing. Keep the affected person warm and at rest. Get medical attention as soon as possible.

INGESTION If chemical is swallowed get medical attention immediately

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SULFURIC ACID

CAS#: 7664-93-9 RTECS:WS5600000 RCRA WASTE NUMBER: N/A
 Synonyms: Hydrogen Sulfate, Oil of Vitriol

	<u>TWA</u>		<u>STEL</u>		<u>CEIL</u>		<u>IDLH</u>		<u>ACTION LEVEL</u>	
	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³
OSHA PEL:	-	1	-	-	-	-	-	80	-	0.5
NIOSH REL:	-	1	-	-	-	-	-	-	-	-
ACGIH TLV:	-	1	-	2	-	-	-	-	-	-

RESPIRATORY PROTECTION RECOMMENDATIONS ABOVE THE DESIGNATED ACTION LEVEL

0 > 0.5 mg/M³
 < 25 mg/M³ Full Face Air Purified
 w/ Acid Gas Cartridge

> 25 mg/M³ SCBA -or- Supplied Air
 w/ Full face piece, pressure demand
 -or- positive pressure.

SYMPTOMS:(Inh,Ing,Contact)
 Skin and eye burning and charring, burns and
 perforations of mucous membranes, corneal damage.

Corrosive Material - DOT label - "CORROSIVE"

Target Organs: Respiratory system, Eyes, Skin,
 teeth.

Concentrated sulfuric acid is colorless, odorless, oily
 liquid. Fuming Sulfuric acid give off free sulfur
 trioxide and is colorless, or slightly colored, viscous
 liquid.

MF: H₂SO₄
 MW: 98.08 SG. 1.834 VP: 1mm @ 145 80

ODOR THRESHOLD: none

PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS:

CLOTHING. Wear appropriate equipment to prevent any possibility of skin contact with liquids containing
 > 1% H₂SO₄, and repeated/prolonged skin contact with liquids ≤ 1% H₂SO₄.

GOGGLES. When any probability of eye contact exists.

WASH: Immediately when skin becomes contaminated.

CHANGE. N/A

REMOVE: Immediately remove any wetted non-impervious clothing.

RECOMMENDED FIRST AID RESPONSE:

EYES. Immediately wash with large amounts of water (15 minutes), no contact lenses should be worn
 when working with this chemical.

SKIN: If this chemical comes in contact with the skin, immediately flush the contaminated skin with
 water, if clothing breakthrough occurs promptly remove clothing and flush skin with water
 Get medical attention promptly.

INHALATION. If large amount of chemical is inhaled, remove to fresh air; if breathing has stopped perform
 rescue breathing. Keep the affected person warm and at rest. Get medical attention as soon
 as possible.

INGESTION. If chemical is swallowed get medical attention immediately.

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NITRIC ACID

CAS# 7697-37-2 RTECS:QU5775000 RCRA WASTE NUMBER: N/A
 Synonyms: Hydrogen Nitrate, Azotic Acid, Aqua Fortis, white/red Fuming Acid

	TWA		STEL		CEIL		IDLH		ACTION LEVEL	
	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³
OSHA PEL:	2	5	4	10	-	-	100		1	2.5
NIOSH REL:	2	5	-	-	-	-				
ACGIH TLV:	2	5.2	4	10	-	-	(REL-TWA for 10-hr exposure)			

RESPIRATORY PROTECTION RECOMMENDATIONS ABOVE THE DESIGNATED ACTION LEVEL

- > 1 ppm (2.5 mg/M³)
 < 50 ppm (125 mg/M³): Full Face Air Purified
 w/ Acid Gas Cartridge
- > 50 ppm (125 mg/M³): SCBA -or- Supplied Air
 w/ Full face piece
 pressure demand -or-
 positive pressure

SYMPTOMS:(Inh,Ing,Contact)

Skin and eye burning and charring, burns and perforations of
 mucous membranes, corneal damage, dental erosion.

Oxidizer/Corrosive Material -- DOT label CORROS.

Target Organs: Respiratory system. Eyes, Skin,
 teeth.

Nitric acid is colorless liquid with a characteristic
 choking odor which fumes in moist air. Fuming
 Nitric Acid is colored yellow to brownish-red

MF: HNO₃
 MW: 63.02 SG 1.502

ODOR THRESHOLD: none

PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS:

- CLOTHING.** Wear appropriate equipment to prevent any possibility of skin contact with liquids with
 pH ≤ 2.5, and repeated/prolonged skin contact with liquids with pH > 2.5
- GOGGLES.** When any probability of eye contact exists.
- WASH:** Immediately when skin becomes contaminated.
- CHANGE:** N/A
- REMOVE.** Immediately remove any wetted non-impervious clothing.

RECOMMENDED FIRST AID RESPONSE:

- EYES.** Immediately wash with large amounts of water (15 minutes), no contact lenses should be worn
 when working with this chemical.
- SKIN:** If this chemical comes in contact with the skin, immediately flush the contaminated skin with
 water, if clothing breakthrough occurs promptly remove clothing and flush skin with water
 Get medical attention promptly.
- INHALATION.** If large amount of chemical is inhaled, remove to fresh air; if breathing has stopped perform
 rescue breathing. Keep the affected person warm and at rest. Get medical attention as soon
 as possible.
- INGESTION.** If chemical is swallowed get medical attention immediately.

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 Environmental Restoration
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APPENDIX C

**Personal Protective Equipment
Selection and Decontamination Guidelines**

1.0 INTRODUCTION

This appendix provides information about personal protective equipment (PPE) protection levels that may be used to assist in complying with the PPE requirements of 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response. As required by the standard, PPE must be selected which will protect employees from the specific hazards which they are likely to encounter during their work on-site. (PPE Requirements must also comply with DOE 5480.11, The HSP manual and the ROI's.) The objective of the decontamination sequences listed are to minimize the risk of exposure to the hazardous substances the PPE is protecting against. These steps outline the maximum amount of decontamination that could be taken for each level of protection.

2.0 PPE Selection

Selection of the appropriate PPE is a complex process which should take into consideration a variety of factors. Key factors involved in this process are:

- . Identification of the hazard and the routes of potential hazard to employees (inhalation, skin absorption, ingestion, and eye or skin contact).
- . An analysis of the performance of the PPE *materials* (and seams) in providing a barrier to these hazards. The amount of protection provided is material-hazard specific. Protective equipment materials will protect well against some hazardous substances and poorly, or not at all, against others.

In many instances, protective equipment materials cannot be found which will provide continuous protection from the particular hazardous substance. In these cases the *breakthrough* time of the protective material should exceed the work durations, or the exposure after breakthrough may pose a hazardous level.

. Matching the PPE to the employee's work requirements and task specific conditions. The durability of PPE materials, such as tear strength and seam strength should be considered in relation to the employee's tasks

The effect of PPE in relation to the heat/cold stress and task duration.

In some cases layers of PPE may be necessary to provide sufficient protection, or to protect expensive PPE inner garments, suits, or equipment.

3 0 PROTECTION LEVELS

The following TABLES provide guidelines which can use to begin the appropriate selection of PPE.

. TABLE C-1 outlines the advantages and disadvantages of the common types of respiratory protection. Selection of respiratory protection is a primary concern since inhalation is one of the major routes of exposure.

Tables C-2 through C-6 provide guidelines concerning the conditions requiring specific levels of protection, the recommended contents of each ensemble, information concerning the limitations of the levels of protection, and the decontamination sequence to be followed for its use.

. Table C-7 provides an equipment checklist for decontamination of PPE.

The reader is cautioned that these listings only provide a brief overview of the information required to establish PPE levels at the ER remedial project work sites. They do not fully address the performance of the specific PPE materials in relation to the specific hazards at the job site. PPE selection, evaluation, and re-selection is an on-going process until sufficient information about the hazard and PPE performance is obtained. Consult with the Health and Safety Liaison Officer for more detailed information.

3.1 Changing Level of Protection

The more that is known about the hazards on the site, the easier the job of PPE selection becomes. As more information about the hazards and conditions at the site become available the ER Health and Safety Officer can recommend to up-grade or down-grade the level of protection to match the tasks at hand.

3.1.1 Specific reasons to up-grade the level of protection:-

- . Known or suspected presence of dermal hazards.
- . Occurrence or likely occurrence of gas or vapor emission.
- . Change in work task that will increase contact or potential contact with hazardous materials.
- . Request of an individual performing the task.

3.1.2 Specific reasons to down-grade the level of protection:

- . New information indicating that the situation is less hazardous than was originally thought.
- . Change in site conditions that decreases the hazard.
- . Change in the work tasks that will reduce contact with the hazardous materials.

4.0 PPE Quality

Where applicable, PPE used should have the certification from the National Institute for Occupational Safety and Health (NIOSH).

TABLE C-1. RESPIRATORY PROTECTION TYPES

TYPE OF RESPIRATOR	ADVANTAGES	DISADVANTAGES
ATMOSPHERE-SUPPLYING		
Self-contained Breathing apparatus (SCBA)	Provides the highest available level of protection against airborne contaminants and oxygen deficiency.	Bulky, heavy (up to 35 lb) Finite air supply limits work duration
	Provides the highest available level of protection under strenuous work conditions.	May impair movement in confined spaces
.....
Positive-pressure -or - Pressure Demand supplied-air respirators	Less bulky and heavy than an SCBA Protects against most airborne contaminants	Not approved for use in IDLH or in oxygen-deficient atmospheres unless equipped with an emergency egress unit (e.g. escape-only SCBA) MSHA/NIOSH certification limits hose length to 300 ft. (90 meters) Length of hose may reduce air flow at facepiece to below minimum. Air line vulnerable to damage, contamination, degradation. DECON is difficult Requires supervision/ monitoring of air supply.
AIR-PURIFYING		
Air-purifying respirator	Enhanced mobility Lighter in weight than an SCBA. Generally weighs 2 pounds (1 Kg) or less.	Cannot be used in IDLH or oxygen deficient atmospheres. Limited duration of protection. May be hard to gauge safe operating time Only protects against specific chemicals to specific concentrations Use requires monitoring of contaminants and oxygen levels Can only be used against Gas/Vapor contaminants with adequate warning properties, when the service is known and a safety factor is applied or when the unit has an End-of-Service-Life Indicator

TABLE C-2a. LEVEL A PROTECTION SELECTION

LEVEL A

Highest available level of respiratory, skin, and eye protection.

SHOULD BE USED WHEN	NECESSARY EQUIPMENT	LIMITING CRITERIA
<u>RECOMMENDED:</u>		
When the hazardous substance has been identified and requires the highest level of protection for the skin, eyes, and other respiratory system based on:	. Pressure-Demand, full facepiece SCBA or pressure-demand supplied air respirator with escape SCBA approved by MSHA or NIOSH	Fully-encapsulating suit material must be compatible with the substance involved.
measured (or potential for) high concentrations of atmospheric vapors, gases, or particulates	Totally-encapsulating, chemical resistant (TECP) suit.	
site operations and work functions involve a high potential for splash, immersion, or exposure to unexpected vapors, gases, or particulates of material that are harmful to skin or capable of being absorbed through the skin.	. Inner chemical resistant gloves Chemical resistant safety boot/shoes. . two-way radio communications	
<u>OPTIONAL:</u>		
When substances with a high degree of hazard to the skin are known or suspected to be present, and skin contact is possible.	. Cooling suit . Coveralls . Long underwear	
Operations are being conducted in confined, poorly ventilated areas, and the absence of conditions requiring LEVEL A have not yet been determined.	Hard hat . disposable gloves and boot covers	

TABLE C-2b. DECONTAMINATION STATIONS FOR LEVEL A

STATION 1:	Segregated Equipment Drop	Deposit equipment used on site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths. Segregation at the drop reduces the potential of cross-contamination.
STATION 2:	Boot cover and glove wash	Scrub outer boot covers and gloves with decon solution
STATION 3:	Boot cover and glove rinse	Rinse off decon solution from Station 2 using copious amounts of water.
STATION 4:	Tape removal	Remove tape around boots and gloves and deposit in container with plastic liner.
STATION 5:	Boot cover removal	Remove boot cover and deposit in container with plastic liner
STATION 6:	Outer glove removal	Remove outer gloves and deposit in container with plastic liner
STATION 7:	Suit and safety boot wash	Wash encapsulating suit and safety boots. Scrub with long hair brush and decon solution. Repeat as many times as necessary.
STATION 8:	Suit and boot rinse	Rinse off decon solution using copious amounts of water. Repeat as many times as necessary.
STATION 9:	Tank change	If worker leaves Exclusion Zone to change air tank, this is the last step in the decontamination procedure. Workers air tank is exchanged, new outer gloves and boot covers are donned, and are taped. Worker returns to duty.

TABLE C-2b. DECONTAMINATION STATIONS FOR LEVEL A

STATION 10:	Safety Boot removal	Remove safety boots and deposit in container with plastic liner
STATION 11:	Fully encapsulating suit and hard hat removal	Fully encapsulated suit is removed with the assistance of a helper and laid out on a drop cloth or hung up Hard hat is removed.
STATION 12:	SCBA backpack removal	While still wearing face piece, remove backpack and place on table Disconnect hose from regulator valve.
STATION 13:	Inner glove wash	Wash inner gloves with decon solution.
STATION 14:	Inner glove rinse	Rinse inner glove with water.
STATION 15:	Face piece removal	Remove face piece. Deposit in container with plastic liner Avoid touching face with fingers.
STATION 16:	Inner glove removal	Remove inner gloves and deposit in container with plastic liner
STATION 17:	Inner clothing removal	Remove inner clothing. Place in container with plastic liner Do not wear inner clothing off site.
STATION 18:	Field wash	Shower if highly toxic, skin-corrosive or skin-absorbable materials are known or suspected to be present. Wash hands and face, if shower is not available, before leaving the site.
STATION 19:	Redress	Put on clean clothes.

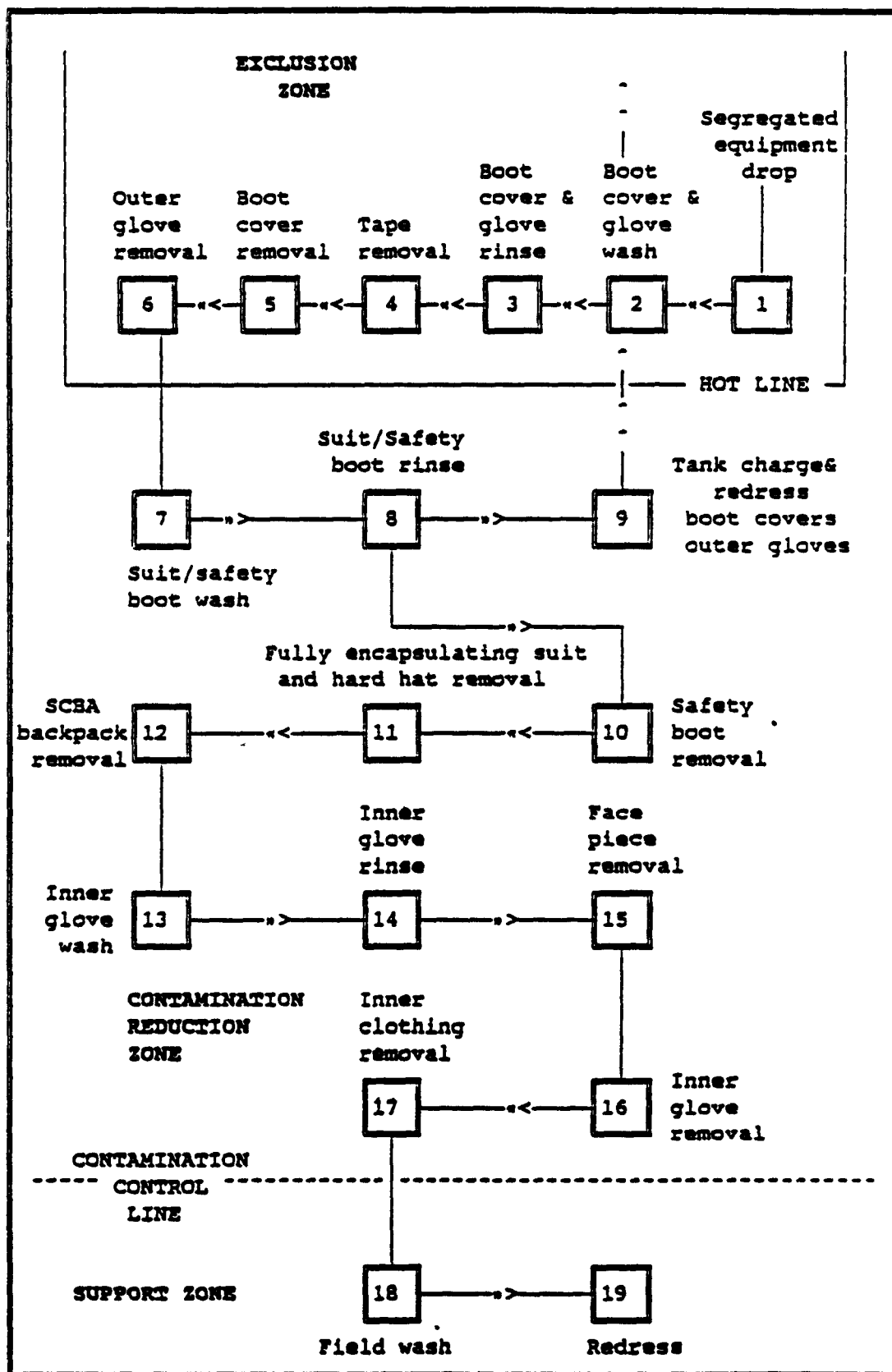


Figure C-1. Step-off Decontamination Sequence - Level A Protection

TABLE C-3a. LEVEL B PROTECTION

LEVEL B

The same level of respiratory protection but less skin protection than LEVEL A. Minimum level recommended for initial site entries and until the hazards have been further defined.

SHOULD BE USED WHEN	NECESSARY EQUIPMENT	LIMITING CRITERIA
<u>RECOMMENDED:</u>		
The type of atmosphere concentrations of substances have been identified and require a high level of respiratory protection but less skin protection; involving atmospheres:	. Pressure-Demand, full facepiece SCBA or pressure-demand supplied air respirator with escape SCBA approved by MSHA or NIOSH	Use only when the vapors or gases present are not suspected of containing high concentrations of chemicals that are harmful to the skin or capable of being absorbed through the skin.
with IDLH concentrations of specific substances that do not represent a severe skin hazard	. Chemical-resistant clothing (coveralls and long sleeved jacket; hooded, one or two piece chemical splash suit; disposable chemical-resistant, one-piece suit).	Use only when it is highly unlikely that the work being done will generate either high concentrations of vapors, gases, or particulate or splashes of material that will effect exposed skin.
or		
. that do not meet the criteria for air purifying respirators	. Inner and outer chemical-resistant gloves	
Atmospheres containing less than 19.5 percent oxygen	. Chemical-resistant safety boot/shoes	
Presents of incompletely identified vapors or gases is indicated by direct reading organic vapor detection instrument, but vapors or gases not suspected of containing high levels of chemicals harmful to skin or capable of being absorbed through the skin.	. Hard hat	
	. Two-way radio communication.	
	<u>OPTIONAL:</u>	
	. Long underwear	
	. Chemical-resistant disposable outer boot/glove covers	
	. Face shield	

Table c -3b. DECONTAMINATION STATIONS FOR LEVEL B

STATION 1:	Segregated Equipment Drop	Deposit equipment used on site (tools, sampling devices and containers, monitoring instruments radios, clipboards, etc.) on plastic drop cloths. Segregation at the drop reduces the probability of cross-contamination.
STATION 2:	Boot cover and glove wash	Scrub outer boot covers and gloves with decon solution
STATION 3:	Boot cover and glove rinse	Rinse off decon solution from Station 2 using copious amounts of water.
STATION 4:	Tape removal	Remove tape around boots and gloves and deposit in container with plastic liner.
STATION 5:	Boot cover removal	Remove boot cover and deposit in container with plastic liner
STATION 6:	Outer glove removal	Remove outer gloves and deposit in container with plastic liner
STATION 7:	Suit and safety boot wash	Wash chemical-resistant splash suit, SCBA, gloves, and safety boots. Scrub with long handled brush and decon solution. Wrap SCBA regulator in plastic to keep out of water. Wash backpack assembly with sponges or cloths.
STATION 8:	Suit, SCBA, boot and glove rinse	Rinse off decon solution using copious amounts of water
STATION 9:	Tank change	If worker leaves Exclusion Zone to change air tank, this is the last step in the decontamination procedure. Worker's air tank is exchanged, new outer gloves and boot covers are donned, and joints are taped. Worker returns to duty.

Table C -3b. DECONTAMINATION STATIONS FOR LEVEL B

STATION 10:	Safety Boot removal	Remove safety boots and deposit in container with plastic liner
STATION 11:	SCBA backpack removal	While still wearing face piece, remove backpack and place on table Disconnect hose from regulator valve.
STATION 12:	Splash Suit removal	With assistance from a helper, remove splash suit. Deposit in container with plastic liner.
STATION 13:	Inner glove wash	Wash inner gloves with decon solution.
STATION 14:	Inner glove rinse	Rinse inner glove with water.
STATION 15:	Face piece removal	Remove face piece. Deposit in container with plastic liner. Avoid touching face with fingers.
STATION 16:	Inner glove removal	Remove inner gloves and deposit in container with plastic liner
STATION 17:	Inner clothing removal	Remove inner clothing. Place in container with plastic liner Do not wear inner clothing off the ER remedial project work site.
STATION 18:	Field wash	Wash hands and face before leaving the site.
STATION 19:	Redress	Put on clean clothes.

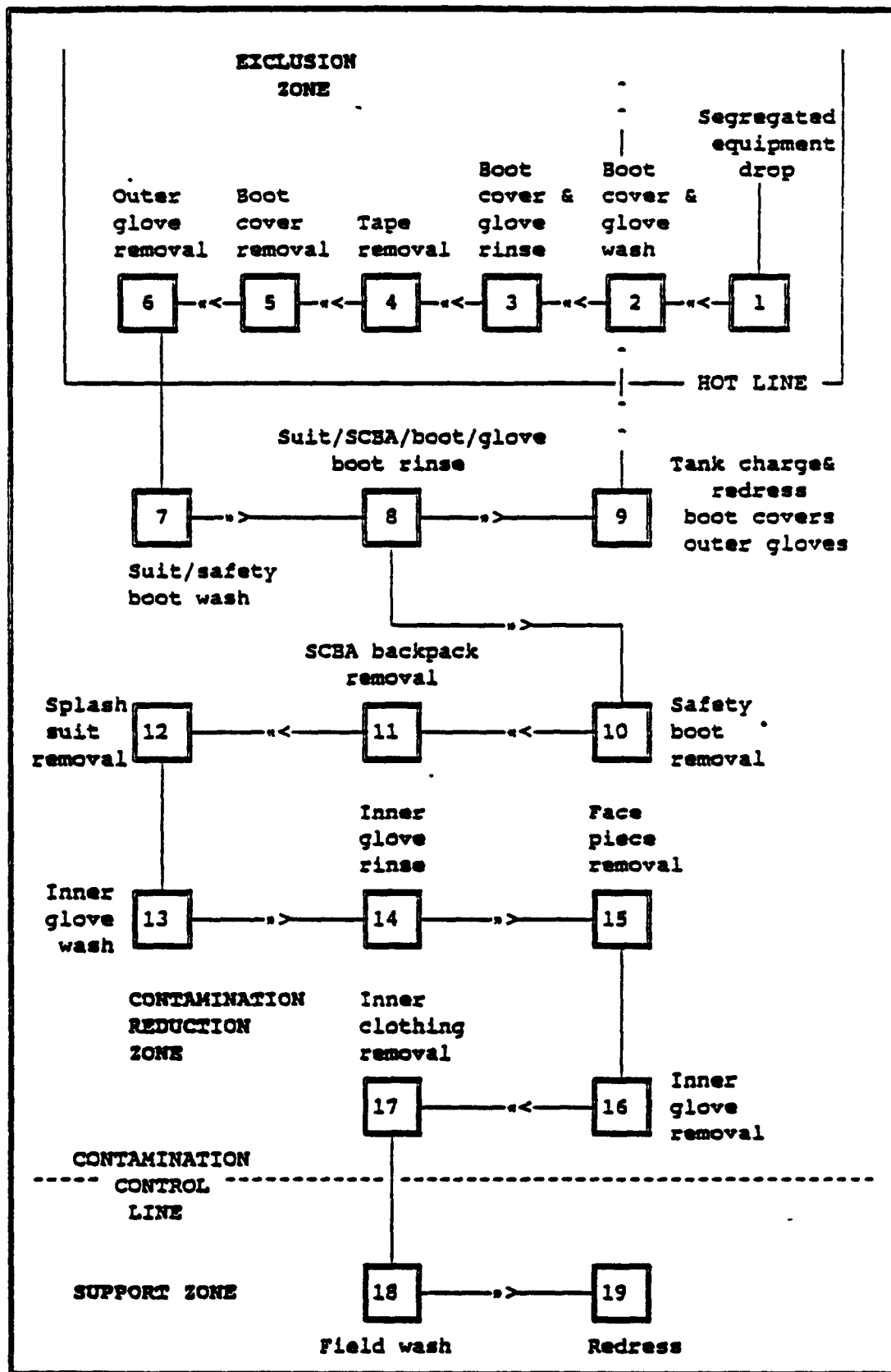


FIGURE C-2. Step-Off Decontamination Sequence - LEVEL B Protection

TABLE C -4a. LEVEL C PROTECTION

LEVEL C

The same level of protection as LEVEL B, but a lower level of respiratory protection

SHOULD BE USED WHEN	NECESSARY EQUIPMENT	LIMITING CRITERIA
------------------------	------------------------	----------------------

RECOMMENDED:

The atmosphere contaminants, liquid splashes, or other direct contact will not adversely effect exposed skin

The type of air contaminants have been identified, concentrations measured, and a canister is available that can remove this contaminant.

All criteria for the use of air purifying respirators are met:

. Air-purifying respirator, full-face, canister-equipped (MSHA or NIOSH approved).

. Chemical-resistant clothing (coveralls; hooded, one- or two-piece chemical splash suit; chemical-resistant hood and apron; disposable chemical-resistant coveralls).

Outer and inner chemical-resistant gloves

Outer chemical-resistant safety boots/shoes.

. Hard hat

. Two-way radio communication.

OPTIONAL:

. Coveralls

. Long underwear

. Outer chemical-resistant, disposable boot covers

. Face shield

Atmospheric concentrations of chemicals must not exceed IDLH conditions.

The atmosphere must contain at least 19.5 percent oxygen

TABLE C-4b. DECONTAMINATION STATIONS FOR LEVEL C

STATION 1:	Segregated Equipment Drop	Deposit equipment used on site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths. Segregation at the drop reduces the probability of cross-contamination.
STATION 2:	Boot cover and glove wash	Scrub outer boot covers and gloves with decon solution.
STATION 3:	Boot cover and glove rinse	Rinse off decon solution from Station 2 using copious amount of water.
STATION 4:	Tape removal	Remove tape around boots and gloves and deposit in container plastic liner.
STATION 5:	Boot cover removal	Remove boot cover and deposit in container with plastic liner
STATION 6:	Outer glove removal	Remove outer gloves and deposit in container with plastic liner
STATION 7:	Suit and safety boot wash	Wash chemical-resistant splash suit, gloves, and safety boots with long-handled brush and decon solution.
STATION 8:	Suit, boot and glove rinse	Rinse off decon solution using copious amounts of water.
STATION 9:	Canister or mask change	If worker leaves Exclusion Zone to change canister (or Mask) is the last step in the decontamination procedure. Worker's canister is exchanged. New outer gloves and boot covers are donned, and joints are taped. Workers returns to duty.

TABLE C 4b. DECONTAMINATION STATIONS FOR LEVEL C

STATION 10:	Safety Boot removal	Remove safety boots and deposit in container with plastic liner
STATION 11:	Splash Suit removal	With assistance from a helper, remove splash suit. Deposit in container with plastic liner.
STATION 12:	Inner glove wash	Wash inner gloves with decon solution.
STATION 13:	Inner glove rinse	Rinse inner glove with water.
STATION 14:	Face piece removal	Remove face piece. Deposit in container with plastic liner. Avoid touching face with fingers.
STATION 15:	Inner glove removal	Remove inner gloves and deposit in container with plastic liner
STATION 16:	Inner clothing removal	Remove inner clothing. Place in container with plastic liner. Do not wear inner clothing off site.
STATION 17:	Field wash	Wash hands and face before leaving the site.
STATION 18:	Redress	Put on clean clothes.

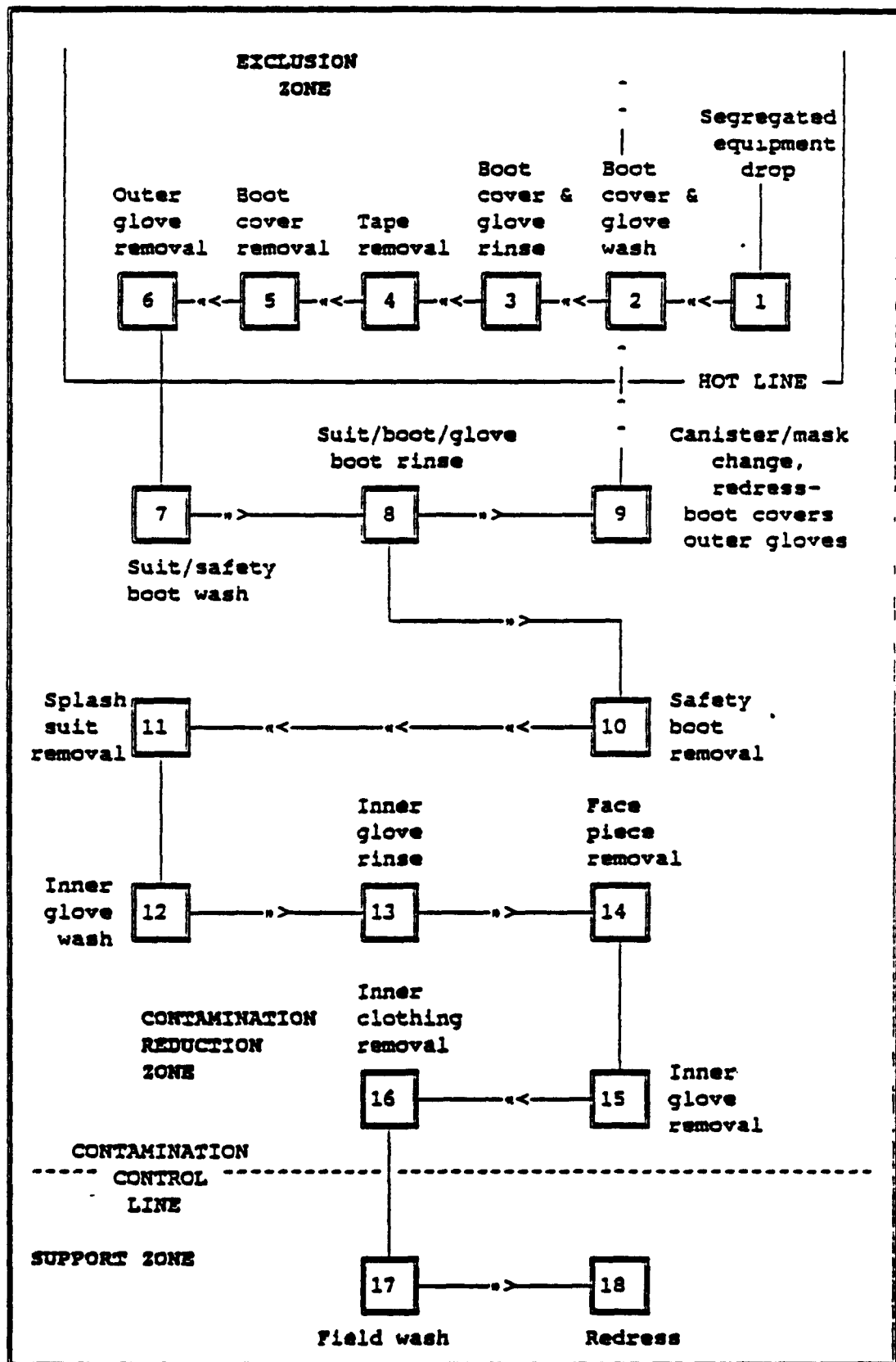


FIGURE C-3. Step-off Decontamination Sequence - Level C Protection

TABLE c -5a. LEVEL D PROTECTION

MODIFIED LEVEL D

The same level of protection as LEVEL C, but with no respiratory protection

SHOULD BE USED WHEN	NECESSARY EQUIPMENT	LIMITING CRITERIA
<u>RECOMMENDED:</u>		
The atmosphere contains no known hazards.	Chemical-resistant clothing (disposable coveralls; hooded chemical splash suit; hood and apron)	Atmospheric concentrations of chemicals must not exceed ACTION LEVELS.
The type of air contaminants have been identified, concentrations measured and below the ACTION LEVELS established for those chemicals	Outer chemical-resistant gloves safety boots/shoes and inner gloves Hard hat	The atmosphere must contain at least 19.5 percent oxygen
Contaminants, liquid splashes, or other direct contact will not adversely effect exposed skin	Two-way radio communication. • Safety glasses with sideshields	
<u>OPTIONAL:</u>		
	Coveralls	
	Long underwear	
	Outer chemical-resistant, disposable boot covers	

LEVEL D

No respiratory protection, minimal skin protection

SHOULD BE USED WHEN	NECESSARY EQUIPMENT	LIMITING CRITERIA
<u>RECOMMENDED:</u>		
The atmosphere contains no known hazards.	Coveralls Safety boots/shoes. Hard hat	This level should not be worn in the EXCLUSION ZONE
Work functions preclude splashes, immersion, or the potential for unexpected inhalation of or contact with hazardous levels of any chemicals.	<u>OPTIONAL</u> Gloves Face shield/safety glasses	The atmosphere must contain at least 19.5 percent oxygen

TABLE c-5a. DECONTAMINATION STATIONS FOR LEVEL MOD D

STATION 1:	Segregated Equipment Drop	Deposit equipment used on site (tools, sampling devices and containers, monitoring instruments, radios, clipboards etc) on plastic dropcloths. Segregation at the drop reduces the prob in of cross-contamination.
STATION 2:	Boot cover and glove wash	Scrub outer boot covers and gloves with decon solution.
STATION 3:	Boot cover and glove rinse	Rinse off decon solution from Station 2 using copious amounts of water.
STATION 4:	Tape removal	Remove tape around boots and gloves and deposit in container plastic liner
STATION 5:	Boot cover removal	Remove boot cover and deposit in container with plastic liner
STATION 6:	Outer glove removal	Remove outer gloves and deposit in container with plastic liner
STATION 7:	Suit and safety boot wash	Wash chemical-resistant splash suit, gloves, and safety boots with long- handled brush and decon solution.
STATION 8:	Suit, boot and glove rinse	Rinse off decon solution using copious amounts of water

TABLE C-5a. DECONTAMINATION STATIONS FOR LEVEL MOD D

STATION 9:	Safety Boot removal	Remove safety boots and deposit in container with plastic liner
STATION 10:	Splash Suit removal	With assistance from a helper, remove splash suit Deposit in container with plastic liner
STATION 11:	Inner glove wash	Wash inner gloves with decon solution.
STATION 12:	Inner glove rinse	Rinse inner glove with water.
STATION 13:	Inner glove removal	Remove inner gloves and deposit in container with plastic liner
STATION 14:	Inner clothing removal	Remove inner clothing. Place in container with plastic liner Do not wear inner clothing off the ER remedial project work site
STATION 15:	Field wash	Wash hands and face before leaving the site.
STATION 16:	Redress	Put on clean clothes.

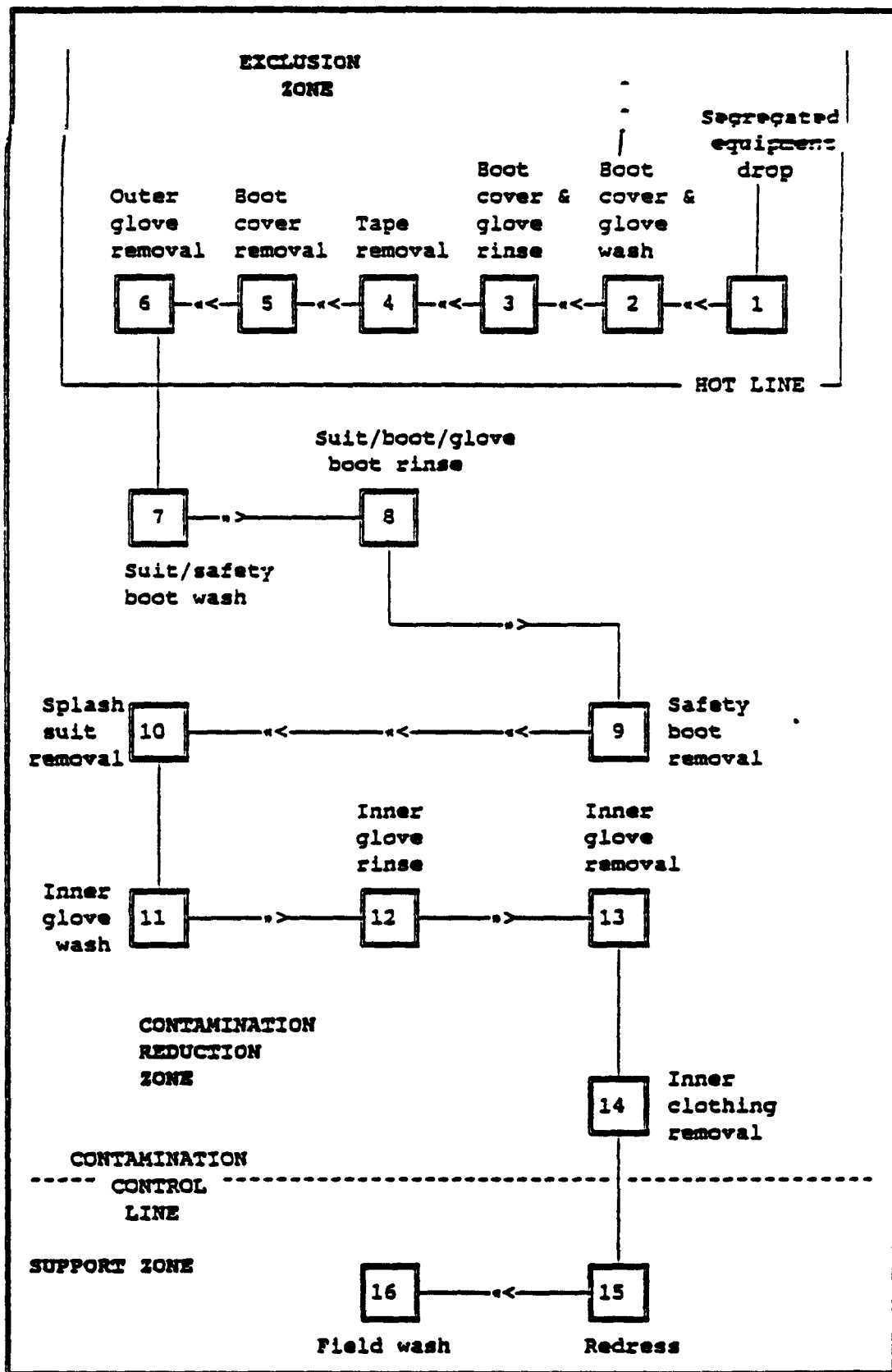


FIGURE C-4. Step-off Decontamination Sequence - Level MOD D Protection

TABLE c -6. EQUIPMENT LIST FOR DECONTAMINATION

STATION 1:	a. (4) 55-gal plastic containers b. Plastic liners c. Plastic drop clothes	STATION 10:	a. (1)55-gal plastic container b. Plastic liners c. Bench or stool d. Boot jack
STATION 2:	a. #10 Wash tub b. Decon solution/detergent water c. 2-3 long handles, soft bristled scrub brushes	STATION 11:	a. Rack b. Drop clothes c. Bench or stool
STATION 3:	a. #10 Wash tub b. High pressure spray unit c. 2-3 long handled, soft bristled scrub brushes	STATION 12:	a. (1)55-gal plastic container
STATION 4:	a. (1) 55-gal plastic container b. Plastic liners	STATION 13:	a. #10 Wash tub b. Decon solution c. Table
STATION 5:	a. (1) 55-gal plastic container b. Plastic liners	STATION 14:	a. #10 Wash tub b. Water c. Table
STATION 6:	a. (1) 55-gal plastic container b. Plastic liners	STATION 15:	a. (1)55-gal plastic container b. Plastic liners
STATION 7:	a. #10 Wash tub b. Decon solution/detergent water c. 2-3 long handled, soft bristled scrub brushes	STATION 16:	a. (1)55-gal plastic container b. Plastic liners
STATION 8:	a. #10 Wash tub b. High pressure spray unit c. 2-3 long handled, soft bristled scrub brushes	STATION 17:	a. (1)55-gal plastic container b. Plastic liners
STATION 9:	a. Air tanks/Canisters b. Tape c. Gloves, shoe covers	Station 18:	a. Basin, water, soap, Towels b. Table
		Station 19:	a. Dressing trailer b. Tables, chairs, clothes c. Lockers

APPENDIX D

**Monitoring Guidelines
for
Heat Stress and Cold Stress**

1.0 HEAT STRESS

1.1 Introduction

Factors affecting susceptibility of an individual to heat stress:

- . Level of PPE required for the task
- . Level of physical fitness
- . Acclimatization to environment
- . Age
- . Dehydration and/or diarrhea
- . Obesity
- . Alcohol or drug use
- . Infection
- . Sunburn

1.2 Control Methods

The criteria established as the Threshold Limit Values (TLV) for heat stress recommended by the American Conference of Governmental Industrial Hygienists (ACGIH) shall be followed to provide adequate cooling of workers.

1.3 One or more of the following control measures shall be used to help control heat stress:

- . Establishment of a work/rest regimen that shall provide adequate rest periods for cooling down. This may require additional shifts for workers or earlier/later work schedules.
- . All breaks are to be taken in a shaded rest area.
- . Adequate liquids shall be provided to replace lost body fluids to ensure that the cardiovascular system functions properly. The thirst mechanism is not sensitive enough to ensure that enough water is drunk to replace lost sweat. Workers should drink a cup or two during every 15 minutes of break time.
- . Replacement fluids can be fresh water or an electrolyte solution, such as Gatorade or Quick Kick, or a combination of these. Salt tablets shall not be used.
- . Cooling devices such as vortex tubes or cooling vests can be worn beneath protective garments.
- . Employees shall remove impermeable protective garments during rest periods.
- . Employees shall not be assigned other tasks during rest periods.
- . All employees shall be informed of the signs and symptoms of heat stress along with the importance of adequate rest, acclimatization, and proper diet in its prevention.

1.4 Signs and Symptoms of Heat Stress

Heat rash may result from continuous worker exposure to heat or humid air.

Heat cramps are caused by heavy sweating with inadequate electrolyte replacement. Signs and symptoms include:

- . Muscle spasms
- . Pain in the hands, feet, and abdomen

Heat exhaustion occurs from increased stress on various body organs including inadequate blood circulation due to cardiovascular insufficiency or dehydration. Signs and symptoms include:

- . Pale, cool, moist skin
- . Heavy sweating
- . Dizziness
- . Nausea
- . Fainting

Heat stroke is the most serious form of heat stress. Temperature regulation fails and the body temperature rises to critical levels. Immediate action must be taken to cool the body before serious injury and death occur. Competent medical help must be obtained immediately. Signs and symptoms are:

- . Red, hot, dry skin
- . Lack of or reduced perspiration
- . Nausea
- . Dizziness and confusion
- Strong, rapid pulse
- . Coma

2.0 MONITORING FOR HEAT STRESS

Specific guidance for performance of monitoring and documentation is provided in Rocky Flats Environmental Restoration Program Standard Operating Procedures, Procedure 6.16.

2.1 During Use of Permeable PPE

Monitoring shall be performed by the Wet Bulb Globe Temperature Index (WBGT) technique. The WBGT shall be compared to the TLV's recommended by the ACGIH. A work/rest regimen shall then be established in accordance with ACGIH/NIOSH guidelines.

2.2 Monitoring During Use of Non-permeable PPE

Monitoring shall begin when ambient temperature in the work area exceeds 70 oF. Frequency of monitoring depends on air temperature adjusted for solar radiation and the level of work load outlined in Table D -1. The method of monitoring shall be either using the worker heart rate or oral temperature.

2.2.1 Heart Rate

When using the heart rate method count the radial pulse during a 30-second period as early as possible in the rest period.

- . If the heart rate exceeds 110 beats/min. at the beginning of the rest period, shorten the next work cycle by one-third and keep the rest period the same.
- . If the heart rate still exceeds 110 beats/min. at the next rest period, shorten the following work cycle by one-third.

2.2.2 Oral Temperature

When using the oral temperature method use a clinical thermometer (3 minutes under the tongue) or a similar device to measure the oral temperature at the end of the work period (before drinking).

CAUTION

DO NOT permit a worker to wear a semipermeable or impermeable garment when his/her oral temperature exceeds 100.6 oF.

. If oral temperature exceeds 99.6 oF (37.6 oC), shorten the next work cycle by one-third without changing the rest period.

. If the oral temperature exceeds 99.6oF(37.6oC) at the beginning of the next rest period, shorten the following work cycle by one-third.

Table D -1. Suggested Frequency of Physiological Monitoring for Fit and Acclimatized Workers^a

ADJUSTED TEMPERATURE ^b (oF)	NORMAL WORK ENSEMBLE ^c (min. of work)	IMPERMEABLE ENSEMBLE (min. of work)
90 or Above	After each 45 mins.	After each 15 mins.
87.5 - 90	After each 60 mins.	After each 30 mins.
82.5 - 87.5	After each 90 mins.	After each 60 mins.
77.5 - 82.5	After each 120 mins.	After each 90 mins.
72.5 - 77.5	After each 150 mins.	After each 120 mins.

^a For work levels of 250 kilocalories/hour

^b Calculate the adjusted air temperature (ta adj) by using this following equation and guidelines: ta adj oF = ta oF + (13 x % SUNSHINE). Measure air temperature (ta) with a standard mercury-in-glass thermometer, with the bulb shielded from radiant heat. Estimate the % SUNSHINE by judging the percent time the sun is not covered by clouds that are thick enough to produce a shadow (100% SUNSHINE = no cloud cover and a sharp, distinct shadow; 0% SUNSHINE = no shadows)

^c Normal work ensemble consists of cotton overalls or other cotton clothing with long sleeves and pants.

3 0 COLD STRESS

• 3 1 Introduction

The following heat loss pathways are factors that can contribute to the amount of injury sustained in the cold environment:

- . **Radiation** - Up to 25% of the heat loss sustained in a cold environment can be attributed to radiation from exposed flesh.
- . **Conduction** - Bare skin contact with cold objects: ladders, metal surfaces, wet clothing, snow, ice, or water all result in a rapid loss of heat in the localized effected area.
- . **Convection** - Best described by the "WIND CHILL INDEX", the movement of air can be the greatest and most deceptive factor of worker body heat loss.
- . **Evaporation** - The body's natural cooling mechanism presents a compounding effect on a conductive environment.

3.2 Prevention Methods

The criteria established as the TLV for cold stress recommended by the ACGIH shall be followed to maintain workers' deep body core temperature.

Additionally, the following methods shall be employed as prevention measures:

- . The work/warm-up schedule recommended by the ACGIH, used to provide adequate periods for re-warming.

Provisions for additional full body protection when work is performed in temperatures at or below 4 °C.

- . Workers will be warned not to allow even inadvertent contact of bare skin with items having a surface temperature below -7°C.
- . For exposed skin, continuous exposure is not be permitted for an equivalent chill temperature at or below -32 °C.

3.3 Evaluation

Unless there are unusual or extenuating circumstances, cold injury to other than hands, feet, and head is not likely to occur without the initial signs of hypothermia. Use Table D - 2 as guide to evaluating symptoms of worker hypothermia.

Table D -2. Progressive Clinical Presentation of Hypothermia²

Core Temp.		Clinical Signs
oC	oF	
37.6	99.6	"Normal" rectal temperature
37	98.6	"Normal" oral temperature
36	96.8	Metabolic rate increases attempting to compensate for heat loss
35	95.0	Maximum shivering
34	93.2	Victim conscious and responsive, with normal blood pressure
33	91.4	Severe hypothermia below this temperature
32	89.6	- Consciousness clouded; blood pressure becomes difficult to obtain; pupils dilated but react to light; shivering ceases
31	87.8	
30	86.0	- Progressive loss of consciousness; muscular rigidity increases, pulse and blood pressure become difficult to obtain; pupils dilated but react to light; respiratory rate increase
29	84.2	
30	82.4	Ventricular fibrillation possible with myocardial irritability
27	80.6	Voluntary motion ceases, pupils nonreactive to light, deep tendon and superficial reflexes absent
26	78.8	Victim seldom conscious
25	77.0	Ventricular fibrillation may occur spontaneously
24	75.2	Pulmonary edema
22	71.6	- Maximum risk of ventricular fibrillation
21	69.8	
20	68.0	Cardiac standstill
18	64.4	Lowest accidental hypothermia victim to recover
17	62.6	Isoelectric electroencephalogram
9	48.2	Lowest artificially cooled hypothermia patient to recover

² American Family Physician, Jan. 1982. Published by the American Academy of Family Physicians.

3.4 Monitoring for Cold Stress

The control program to be used for the ER Sites shall include:

- Medical supervision of the workers performed during the preplacement or "at-risk" physical examination.
 - . Employee orientation and training on cold stress, cold induced illness and their symptoms, water and salt replacement, proper clothing, and emergency first aid procedures.
 - . Work/rest regimes with heated rest areas and enforced rest breaks.
 - . Scheduled drink breaks for recommended fluids.
- Environmental monitoring using the air temperature and wind speed indices to determine wind chill and adjust work/rest schedules accordingly.
- . Reduction of cold stress through the proper use of personal protective equipment, administrative controls, and engineering controls when available.

APPENDIX E
Contractor Health and Safety
Plan Evaluation

Contractor Health and Safety Plan Evaluation

Contractor Name

Street Address

Phone Number

City

State

Zip Code

EG&G Health and Safety Contact

Phone Number

Activities to be conducted by subcontractor:

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Contractor Health and Safety Plan Evaluation (cont)

EVALUATION CRITERIA	YES/NO	CORRECTIONS NEEDED
Does the contractor HSP have the necessary signatures and approvals?	_____	_____
Has the HSP identified the OUs, SWMUs and Task associated with the site?	_____	_____
Has the HSP identified the scope-of-work and described the expected activities?	_____	_____
Does the HSP describe the contractor and EG&G personnel to be working on the site and delineate assignments and responsibilities?	_____	_____
If the HSP concerns several phases of work or tasks, are each task described and detailed?	_____	_____
Does the HSP detail the hazards associated with each operation or task?	_____	_____
Does the HSP specify employee training to the level required by each job function and responsibilities?	_____	_____
Does the HSP require documentation of employee training that is consistent with EG&G policy?	_____	_____
Does the HSP describe the radiation and site-specific training to be conducted, does it meet DOE and OSHA standards?	_____	_____

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Contractor Health and Safety Plan Evaluation (cont)

EVALUATION CRITERIA	YES/NO	CORRECTIONS NEEDED
Does the HSP detail medical surveillance to be conducted? Does the monitoring include baseline bioassays?	_____	_____
Does the HSP detail administrative and engineering controls to mitigate hazards?	_____	_____
Does the HSP identify by task the personal protective equipment to be used when engineering controls are inadequate?	_____	_____
Does the HSP identify the frequency and types of air monitoring, personnel monitoring, radiological monitoring and area sampling to be used?	_____	_____
Are specific procedures described in the HSP that identify instrument maintenance and calibrations?	_____	_____
Are site control measures described in the HSP, and are they consistent with EG&G policy?	_____	_____
Does the HSP identify decontamination procedures that are consistent with EG&G policy?	_____	_____
Are the HSP emergency response plans adequate and compatible with local, state, Federal, and EG&G plans?	_____	_____

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Contractor Health and Safety Plan Evaluation (cont)

EVALUATION CRITERIA	YES/NO	CORRECTIONS NEEDED
Does the HSP detail safe work practices for confined space entry?	_____	_____
Does the HSP detail spill prevention and contingency plans that are adequate and in compliance with EG&G policy?	_____	_____

NOTES: _____

Contractor Health and Safety Plan Evaluation (cont)

REVIEWED BY:

Evaluator's Signature

Date

ER Health and Safety Officer

Date

ER Program Manager

Date

Health and Safety Liaison Officer

Date

Occupational Safety Manager

Date

APPENDIX F

Introduction to Basic Concepts

1.0 INTRODUCTION

An understanding of some basic industrial hygiene concepts is necessary to adequately define the safety and health hazards associated with working at an ER remedial project work site.

To determine a "health hazard," it is necessary to equate the toxicity of a substance or environmental stress with the probability of exposure from the source. By using the toxicity and exposure-limit information available for the suspected contaminant or potential environmental stress, the correct personnel protective requirements can be established. These protective requirements will prevent the worker from being exposed to toxic levels of the contaminant or environmental stress.

The following text gives a brief overview of the basic concepts. The reader is encouraged to seek detailed information from other sources to completely understand the subjects discussed. The initial training course required for hazardous waste site workers should provide additional information about the concepts. Employees should contact the EG&G ER Health and Safety Officer with any additional questions.

2.0 Toxicology

2.1 Toxicity

Toxicity is defined as the ability of a chemical substance or environmental stress to produce an unwanted effect when it has reached a sufficient concentration or level at a certain site in the body.

2.2 Hazard

Hazard is defined as the probability that a worker's exposure will produce a toxic effect in the body.

The hazard from exposure to chemical substances or radioactive materials is a result of inadequately protected or unprotected routes of entry. The hazards from exposure to environmental stresses are not discussed further. However, the principles outlined for chemical/radiological hazards can be equally applied to environmental stress.

2.3 Route of Entry

Common routes of entry are ingestion, injection, skin absorption, and inhalation. Depending on the substance, one or more of these routes may be applicable. The probability of a toxic concentration of a chemical occurring in a worker can be reduced if the routes of entry are understood and the correct work practices and personal protective equipment are used to inhibit that entry.

The Chemical Data Sheets in APPENDIX C of the HSPP list possible routes of entry for contaminants at the ER remedial project work sites. The following is an example of the "SYMPTOMS" section of a Chemical Data Sheet:

"SYMPTOMS:(Inh,Ing,Abs,Contact)"

Inh - Inhalation

Ing - Ingestion

Abs - Skin absorption

Contact - Skin irritation/ no absorption

2.4 Dose-Response Relationship

Completely preventing any or all worker exposure is impractical. Worker exposure however minute, may occur. The dose-response relationship is a practical guide to the selection of controls for worker exposure.

Response is dependent on two variables -- concentration and length of exposure time. An equal response can be generated by an "acute" exposure (high chemical concentrations for a short period of time) or a "chronic" exposure (low chemical concentration for a long period of time).

2.5 Threshold

Threshold is an integral concept used in Industrial Hygiene for the estimation of the response from chemical exposure. No noticeable effects of that chemical exposure can be detected if an individual is exposed to a concentration below the threshold. This is because the body has sufficient time to "detoxify" the chemical. However, there is a limit to this detoxification process. At the concentration just above the threshold, the chemical exposure produces an unwanted effect that can be measured.

2.6 Immediately Dangerous to Life or Health (IDLH)

IDLH is a term that defines a worker exposure that contains a concentration of a material that:

- (1) Poses an immediate threat to the life of a worker.
- (2) Would cause irreversible or delayed adverse health effects.
- (3) Would interfere with a worker's ability to escape from a dangerous atmosphere.

3.0 EXPOSURE LIMITS

3.1 Introduction

Chemical concentrations at levels that preclude a hazardous exposure in an unprotected worker breathing zone have been determined as a result of toxicological studies.

3.2 Established Limits

The Occupational Safety and Health Administration (OSHA) has established regulatory standards mandating the limits for worker breathing zone exposures to many chemicals in 29 CFR 1910.1000, "Air Contaminants-Permissible Exposure Limits (PELs)" (REFERENCE 12). This standard establishes airborne exposure limits for repeated exposure, acute short-term exposure, and ceiling exposure limits.

For chemicals with no OSHA PEL established 29 CFR 1910.120 designates two other organizations as having "Published Exposure Limits" for chemicals common in the

workplace. These "Published Exposure Limits" are used as the regulatory standard in the order presented: The National Institute For Occupational Safety and Health (NIOSH) "Recommended Exposure Limits (RELs)" (REFERENCE 13), and the American Conference of Governmental Industrial Hygienists (ACGIH) "Threshold Limit Values (TLVs)" (REFERENCE 14).

3.3 Terminology

The abbreviations TWA (Time-Weighted-Average), STEL (Short-Term Exposure Limit) and CEIL (Ceiling Limit) are used by each organization (OSHA, NIOSH, and ACGIH) but they each specify a slightly different definitions for these common terms. The terminology is compared in the following paragraphs.

3.3.1 Time-Weighted-Average (TWA)

The time-weighted average concentration for a normal 8-hour workday and a 40-hour workweek.

- . OSHA's PELs shall not be exceeded.
- . NIOSH RELs are based on a 10-hour time weighted average.
- . The ACGIH TLVs specify the limit to which nearly all workers may be repeatedly exposed, day after day, with no adverse effects.

3.3.2 Short-Term Exposure Limit (STEL)

The 15-minute (or any other time period specified) time-weighted average concentration

The OSHA PELs shall not be exceeded.

- . The ACGIH TLVs are the limit to which a worker can be exposed continuously for a short period of time, provided the TWA is not exceeded and without suffering from:

- (1) Irritation
- (2) Chronic or irreversible tissue damage
- (3) Narcosis of sufficient degree to increase the likelihood of accidental injury, impair self-rescue or materially reduce work efficiency

3.3.3 Ceiling Exposure Limit (CEIL)

The concentration that shall not be exceeded during any part of the workday exposure.

OSHA PELs, NIOSH RELs, and ACGIH TLVs all offer this same restriction.

3.3.4 Skin Designation

The chemicals with a skin designation are those that will contribute to exposure through dermal exposure. 29 CFR 1910.120 requires that engineering controls or work practices be implemented or employees wear gloves, coveralls, goggles, or appropriate protective clothing to prevent or reduce skin absorption.

3.3.5 Action Level

The Action Level is an administrative control used to identify a worker breathing zone concentration limit for a contaminant at which engineering controls must be implemented to prevent worker exposure. Engineering controls can take the form of increased ventilation, increased volatilization time, or as a last resort, personal protective devices such as respirators. A generally accepted practice is to select the most restrictive of the three exposure limits as the applicable limitation for worker exposure and establish an ACTION LEVEL at 50% of that value. This provides an adequate buffer for the OSHA PELs to prevent a noncompliance exposure and also takes into account the most sensitive worker response.

3.3.6 Examples from HSPP

The PELs, RELs, TLVs, IDLH concentrations (if stated), and Action Levels for the contaminants at the ER remedial project work sites can be found in the Chemical Data Sheets provided in APPENDIX B of this HSPP:

Excerpt from APPENDIX C "CHEMICAL DATA SHEETS"

TRICHLOROETHENE

CAS#: 79-01-6 RTECS.KX4550000 RCRA WASTE NUMBER: U228

Synonyms: Ethylene trichloride; Trichloroethylene, Triclene

	<u>TWA</u>		<u>STEL</u>		<u>CEIL</u>		<u>IDLH</u>		<u>ACTION LEVEL</u>	
	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³	ppm	mg/m ³
OSHA PEL:	50	270	200	1080	-	-	-	-	25	135
NIOSH REL:	25	(10 hr)	-	-	-	-	-	-	-	-
ACGIH TLV:	50	269	200	1070	-	-	-	-	-	-

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10 SUMMARY

The toxicity of the contaminants present at an ER remedial project work site is a physical constant. The level of hazard associated with the contaminants will vary for different tasks and locations as the probability of exposure changes. When assigning protection levels, carefully consider the following factors:

- . The general guidelines to minimize the probability of exposure contained in the "Personal Protective Equipment Requirements" section of the Chemical Data Sheets.
- . The conditional requirements for the proper assignment of levels of personal protection equipment contained in APPENDIX E.

The level of worker protection designated for each task will be directly related to the Health and Safety professionals estimate of probable exposure. This "Task by Task" Hazard Assessment will be documented in the APPENDIX D of this HSPP.